

COPAS™ BIOSORT INSTRUMENT

Automated Analysis, Sorting, and Dispensing of small model organisms, beads, and particles

SERVICE MANUAL

Rev. 1.00

Last Updated On: May 8, 2003

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Introduction

The COPAS BIOSORT automates the analysis, sorting, and dispensing of objects ranging from 40 - 125 microns including particles, beads, seeds, and small model organisms. Using the physical parameters of object length, optical density, and the intensity of fluorescent markers, objects are sorted according to user selectable criteria, and then may be dispensed into stationary bulk receptacles or multi-well microtiter plates.

This COPAS BIOSORT Service Manual details those procedures pertinent to the maintenance of the COPAS instrument and all top level assemblies that are used in the manufacture of the instrument. Requests for more detailed lower level parts and materials will be addressed by Union Biometrica, Inc. on an individual basis.

Warranty

The Union Biometrica COPAS instrument is warranted to be free from defects in material and workmanship for a period of one (1) year from the date of installation and acceptance. Union Biometrica or authorized personnel will repair, at our election, by replacement, any part of the instrument, which fails within the warranty period. As a part of this warranty period, the customer will receive unlimited telephone assistance support Monday through Friday, during normal working hours from 9:00 AM-5:00 PM Eastern Standard Time, up to four (4) emergency on-site visits per year, all replacement parts, labor, and travel, and one (1) preventive maintenance visit per year. This warranty is extended to the original buyer purchasing the equipment from Union Biometrica or authorized distributor.

This warranty does not include routine cleaning, adjustment or normal wear and tear from use unless designated by buyer as its annual preventative maintenance visit and excludes: (A) Service or parts required due to damage caused by accident, neglect, breakage, misuse, alteration to the equipment, electrical current fluctuations, unfavorable environmental conditions, work performed by an unauthorized agent, or forces of nature; (B) work which, in the sole exclusive opinion of Union Biometrica, is impractical to perform because of the platform's location or proximity to any other device; (C) modifications to the instrument for performance outside of the published performance specifications; (D) Service required to parts in the system that have been exposed to or otherwise affected by solutions or reagents not manufactured by Union Biometrica, or another authorized manufacturer, which causes poor or erratic performance and / or shortened component life; (E) Service performed by an unauthorized third party; or (F) instrument refurbishing for cosmetic purposes. All parts replaced under the original warranty will be warranted only until the end of the original instrument warranty. Union Biometrica must receive all requests for warranty replacement or authorized distributor within thirty (30) days after the component failure.

It is the owner's responsibility to maintain the instrument in accordance to Union Biometrica's guidelines.

Union Biometrica reserves the right to change, alter, modify or improve any of its instruments without obligation to make corresponding changes to any instrument previously sold OR shipped. All service will be rendered during Union Biometrica's normal hours of operation. Repairs requested outside of normal business hours will be performed at Union Biometrica's discretion, at prevailing after hour rates. Such requests must be accompanied by an approved purchase order.

The following exceptions apply:

1. Consumable items, including reagents and solutions, pump tubing, tubing, are warranted to be free of defects at the time of installation. Union Biometrica does not warrant parts and accessories not manufactured by or for Union Biometrica. Union Biometrica will assist buyer in obtaining any information or service from any manufacturer for any part not covered by Union Biometrica.
2. Freight charges are at the customers' expense.

The warranty is invalid if:

1. The COPAS platform is used for purposes outside the scope of supported applications and specifications.
2. System modifications, not approved by Union Biometrica in writing, are performed.

Warnings and Precautions

The COPAS BIOSORT is a Class I laser product containing a Class IIIA laser. The COPAS Argon Laser System contains a Class III B laser, which is fiber coupled through a fiber optic. Only qualified service personnel should remove the COPAS Argon Laser System or the optics assembly covers.

The COPAS BIOSORT is comprised of the Dispenser and the Argon Laser System. This term is used in reference to the combination of these two components. Use of the COPAS BIOSORT Dispenser and Argon Laser System in a manner not specified by Union Biometrica may impair the protection provided by the equipment.

The COPAS instrument will be factory shipped to you in protective packaging and will be installed by a trained Union Biometrica, Inc. representative. The Union Biometrica service representative will also verify the system performance. If the instrument must be moved or maintenance must be performed, Union Biometrica, Inc. recommends that a trained Union Biometrica representative install the system and perform most maintenance functions. The connection of the Laser fiber optic cable requires special attention and should not be attempted by untrained persons.

In order to prevent the system from overheating, ensure that the installation permits the unrestricted flow of air around the system components and confirm prior to installation that the Work Area and Facilities specifications have been met.

The COPAS BIOSORT should be used only by trained laboratory personnel. Use of this instrument by an untrained operator could result in damage to the product or injury to the operator.

Other than procedures outlined in the Operator's Manual, there are no other operator required electrical, optical, or mechanical adjustment or serviceable components.

Please refer to the Operator's Manual for complete Safety Warnings and Precautions.

Shipping Checklist Form

For Customers located in North America, Japan

COPAS BIOSORT

Part Number: 350-5000-000

Serial Number: _____

<u>Quantity</u>	<u>Description</u>	<u>Part Number</u>
<input type="checkbox"/> 1	Power Cord Cable	066-0004-000
<input type="checkbox"/> 1	Power Strip	066-0007-500
<input type="checkbox"/> 1	RS-232 Data Cable	066-0009-010
<input type="checkbox"/> 1	CSM Cable - ReFLX ONLY	066-0009-020
<input type="checkbox"/> 1	Laser Power Cord	067-0020-004
<input type="checkbox"/> 1	Strait Blade Laser Plug	067-0030-001
<input type="checkbox"/> 2	Tubing Clamp	100-0010-001
<input type="checkbox"/> 20 ft.	PVC Air Tubing	111-0250-002
<input type="checkbox"/> 1	Threaded/Barbed Air Fitting	119-0003-000
<input type="checkbox"/> 1	Slotted Screwdriver	145-0020-000
<input type="checkbox"/> 1	Waste Bottle	300-5044-000
<input type="checkbox"/> 1	Vent Tubing	300-5062-000
<input type="checkbox"/> 1	Waste Pump Tubing	300-5068-000
<input type="checkbox"/> 2	GP Sheath Reagent and MSDS	300-5070-000
<input type="checkbox"/> 1	Cleaning Reagent and MSDS	300-5072-000
<input type="checkbox"/> 1	Installation Disc	300-5080-_____
<input type="checkbox"/> 1	Laser System Cable	310-5018-000
<input type="checkbox"/> 1	GP Control Particles and MSDS	310-5071-000
<input type="checkbox"/> 1	Bubble Trap Filter (only with ReFLx)	340-5014-000
<input type="checkbox"/> 1	Reference Manual	350-5074-000
<input type="checkbox"/> 1	Information Packet	

Packaged by: _____ Date: _____ Inspected by: _____ Date: _____

For Customers located in Europe (except United Kingdom)

COPAS BIOSORT

Part Number: 350-5000-000

Serial Number: _____

	<u>Quantity</u>	<u>Description</u>	<u>Part Number</u>
<input type="checkbox"/>	1	Power Strip	066-0007-000
<input type="checkbox"/>	4	Jumper Cables	066-0007-100
<input type="checkbox"/>	1	Power Strip/Wall Cable	066-0007-200
<input type="checkbox"/>	1	Laser/Wall Cable	066-0007-300
<input type="checkbox"/>	1	Compressor/Wall Cable	066-0007-400
<input type="checkbox"/>	1	RS-232 Data Cable	066-0009-010
<input type="checkbox"/>	1	CAM Cable - ReFLX ONLY	066-0009-020
<input type="checkbox"/>	2	Tubing Clamp	100-0010-001
<input type="checkbox"/>	20 ft.	PVC Air Tubing	111-0250-002
<input type="checkbox"/>	1	Threaded/Barbed Air Fitting	119-0003-000
<input type="checkbox"/>	1	Slotted Screwdriver	145-0020-000
<input type="checkbox"/>	1	Waste Bottle	300-5044-000
<input type="checkbox"/>	1	Vent Tubing	300-5062-000
<input type="checkbox"/>	1	Waste Pump Tubing	300-5068-000
<input type="checkbox"/>	2	GP Sheath Reagent and MSDS	300-5070-000
<input type="checkbox"/>	1	Cleaning Reagent and MSDS	300-5072-000
<input type="checkbox"/>	1	Installation Disc	300-5080-_____
<input type="checkbox"/>	1	Laser System Cable	310-5018-000
<input type="checkbox"/>	1	GP Control Particles and MSDS	310-5071-000
<input type="checkbox"/>	1	Bubble Trap Filter (only with ReFLx)	340-5014-000
<input type="checkbox"/>	1	Reference Manual	350-5074-000
<input type="checkbox"/>	1	Information Packet	

Packaged by: _____ Date: _____ Inspected by: _____ Date: _____

For Customers located in United Kingdom

COPAS BIOSORT

Part Number: 350-5000-000

Serial Number: _____

	<u>Quantity</u>	<u>Description</u>	<u>Part Number</u>
<input type="checkbox"/>	1	Power Strip	066-0007-000
<input type="checkbox"/>	4	Jumper Cables	066-0007-100
<input type="checkbox"/>	1	Power Strip/Laser/Wall Cable	066-0007-310
<input type="checkbox"/>	1	Laser/Compressor/Wall Cable	066-0007-410
<input type="checkbox"/>	1	RS-232 Data Cable	066-0009-010
<input type="checkbox"/>	1	CSM Cable - ReFLX ONLY	066-0009-020
<input type="checkbox"/>	1	Laser Power Cord	067-0020-003
<input type="checkbox"/>	2	Tubing Clamp	100-0010-001
<input type="checkbox"/>	20 ft.	PVC Air Tubing	111-0250-002
<input type="checkbox"/>	1	Threaded/Barbed Air Fitting	119-0003-000
<input type="checkbox"/>	1	Slotted Screwdriver	145-0020-000
<input type="checkbox"/>	1	Waste Bottle	300-5044-000
<input type="checkbox"/>	1	Vent Tubing	300-5062-000
<input type="checkbox"/>	1	Waste Pump Tubing	300-5068-000
<input type="checkbox"/>	2	GP Sheath Reagent and MSDS	300-5070-000
<input type="checkbox"/>	1	Cleaning Reagent and MSDS	300-5072-000
<input type="checkbox"/>	1	Installation Disc	300-5080-_____
<input type="checkbox"/>	1	Laser System Cable	310-5018-000
<input type="checkbox"/>	1	GP Control Particles and MSDS	310-5071-000
<input type="checkbox"/>	10	Bubble Trap Filter (only with ReFLx)	340-6000-000
<input type="checkbox"/>	1	Reference Manual	350-5074-000
<input type="checkbox"/>	1	Information Packet	

Packaged by: _____ Date: _____ Inspected by: _____ Date: _____

Reagents Used

Do not use unapproved solutions in the COPAS BIOSORT. The use of unapproved solutions can cause damage to the device and will void the warranty. The specialized reagents discussed below are available from Union Biometrica, Inc. Material Safety Data Sheets are enclosed in every shipment of Union Biometrica, Inc. supplied reagents and are also available upon request.

NOTE: Performance Specifications are only valid with Union Biometrica, Inc. reagents.

Sheath Reagent

Sheath reagent is an aqueous based reagent containing surfactant. The sheath reagent must be compatible with the control particles used and the sample to be analyzed. For most applications, COPAS GP Sheath, PN 300-5070-000 is recommended.

Two 20 Liter containers of PN 300-5070-000 are shipped with each COPAS BIOSORT instrument.

Control Particles

Control particles are latex beads that are uniform in size, suspended in a reagent compatible with the sheath reagent and sample to be analyzed. For most applications, GP 42 micron HF Control Particles, PN 310-5071-000 are recommended.

One 1 Liter container of PN 310-5071-000 is shipped with each COPAS BIOSORT instrument.

Cleaning Reagent

Cleaning reagent is an aqueous based reagent containing surfactant specially formulated for use with all COPAS platforms. This solution should be used for daily cleaning procedures. Cleaning reagent should be used for daily maintenance.

One 1 Liter container of PN 300-5072-000 is shipped with each COPAS BIOSORT instrument.

Bleach

Bleach is used on the COPAS instrument for troubleshooting procedures including breaking up proteins potentially causing a blockage in the flow cell or fluidics. Bleach is also used to clean the internal flow cell. The manufacturer does not supply ethanol.

NOTE: DO NOT use on external surfaces of optical components

UNION BIOMETRICA, INC. recommends that Clorox® brand bleach be used due to its observed low particulate count. If a different brand of bleach is used, filtering is required.

When using bleach, use 5% sodium/calcium hypochlorite at a 50% dilution.

Sterilization Solution

70% Ethanol is used on the COPAS instrument for sterilization procedures and in certain troubleshooting procedures. The manufacturer does not supply ethanol.

Materials Required for Service (Not Provided)

- Screwdrivers: 10”+ length and jewelers size
- Oscilloscope & PMT wires
- Needle nose pliers
- Paper towels
- Cable ties to secure tubing and cables
- 50 mL syringes for removing liquid from the sample cup
- 96 well plates and lids
- Argon Laser Alignment Glasses [2-3@488-515nm, amber lens, 70% VLT] – Only required if service will be performed on the Argon Laser by the customer. *Union Biometrica highly recommends that any laser service be performed by a Union Biometrica trained service person.*

Work Area and Facilities Specifications

Prior to installation of the COPAS BIOSORT instrument, confirm that the work area and facilities comply with the below specifications.

Work Area Requirements

- The COPAS system requires a permanent, open, level, vibration free, working space with the dimensions of 3 feet (1 meter) deep x 7 feet (2.3 meters) wide x 4.75 feet (1.4 meters) high. No other equipment should be placed over the COPAS system. There also should be user access on both sides of the working area.
- A COPAS system with the optional Zymark Twister® Robot will need an additional space to the left of the COPAS of 3 feet (1 meter) deep x 2 feet (0.6 meters) wide x 2 feet (0.6 meters) high.
- The Union Biometrica supplied optional Air Compressor requires approximately 14 inches (36 centimeters) deep x 18 inches (46 centimeters) wide x 20 inches (51 centimeters) high of stable floor space.

Environmental Requirements

- This instrument is designed for use at an altitude of up to 2000 meters, in an ambient operating temperature between 15° and 30°C (60° to 85°F) with a relative humidity of 0% to 85% non-condensing, decreasingly linearly to 50% relative humidity at 40°C (104°F). Temperature should not fluctuate more than +/- 1.5 °C from the time of experimental setup through completion or adjustments will need to be made.
- Ensure that adequate ventilation of the system components is provided. It is important that ventilation openings not be blocked while the system is powered ON.
- The system generates approximately 3800 BTU/Hr.
- This instrument is rated, per IEC 60529, for installation in an IP00 environment. It is intended that it be installed in a laboratory environment protected from dust and spray.

Air Requirements

- The input air pressure should be at least 50 psi but no more than 100 psi of filtered, at 2 CFM, of non-condensing, water and oil free air. The optional COPAS Air Compressor is available for laboratories that cannot meet these requirements.

Electrical Requirements

- Place the COPAS system and components within 6 feet (2 meters) to the power outlets.
- COPAS systems and the Laser should each be connected to separate, dedicated electrical supply circuits, using the supplied detachable line cords (or CE7/VII approved equivalent detachable cords for Europe). The supply circuits must be compliant with local electrical codes, and must include a dedicated protective ground connection to protect the system. The main supply voltage is not to exceed 10% of the nominal voltage.
- Place the instrument so that the detachable line cords remain readily accessible. This is essential to permit use of the line cords as the emergency disconnection devices in case of a fault.
- Circuit Requirements for 120 VAC Countries:
 - COPAS Instrument, PC & monitor – 100-120VAC, 15 Amp, 50/60 HZ, single phase on a dedicated line with protective earth ground.
 - Argon Laser System – 100-120VAC, 20 Amp, 50/60 HZ, single phase on a dedicated line with a protective earth ground.
 - Air Compressor (optional) – 100-120VAC, 13 Amp, 50/60 HZ, single phase on a dedicated line with protective earth ground. (May be placed on instrument line if necessary if surge protection is provided for the instrument, PC, and monitor.)
- Circuit Requirements for 230 VAC Countries:
 - COPAS Instrument, PC & monitor – 220/240VAC, 10 Amp, 50/60 HZ, on separate dedicated lines with protective earth ground.
 - Laser – 220/240VAC, 16 Amp, 50/60 HZ, on separate dedicated lines with protective earth ground.
 - Air Compressor (optional) – 220/240VAC, 10 Amp, 50/60 HZ, single phase on a dedicated line with protective earth ground. (May be placed on instrument line if necessary if surge protection is provided for the instrument, PC, and monitor.)

Unpacking the COPAS Instrument

General recommended guidelines for unpacking a COPAS instrument and laser assembly.

1. Confirm work area and facilities meet specifications outlined by Union Biometrica in this Service Manual.
2. Inspect all containers for damage. If there is any damage, contact Union Biometrica immediately to report the damage.
3. Inventory all containers. It is recommended that, if storage area is available, customers keep the COPAS instrument containers to be used for long term instrument storage, or moving the instrument from one location to another.
4. Remove system components from containers and move to laboratory bench where the system will be permanently located.
5. Due to the weight of the instrument [40 Kg (88 lbs)], a minimum of two people is required to move the COPAS BIOSORT. In order to lift the unit safely without tipping, one person should be located on either side of the instrument to lift the unit by placing one hand under the front and one under the rear of the base.
6. Due to the weight of the external laser, [33.6 Kg (74 lbs)], a minimum of two people is also required to move the unit. Lift the Argon Laser System by placing one hand under the front and one under the rear of the base.
7. Connect all cables, tubing, and bottles according to COPAS BIOSORT System Interconnect Drawing and COPAS BIOSORT Fluidic Diagram contained in this Service Manual.

Optical Fiber Inspection, Installation and Cleaning

According to UBI Operational Instruction: OI 112, Optical Fiber Inspection, Installation and Cleaning Instructions, Revision No. 1, (Last revision date: 1/22/02)

Purpose: The purpose of this OI is to describe the pre-installation inspection procedure, the installation procedure, the installation inspection procedure and the cleaning procedure of an Optical Fiber.

NOTE: Use proper laser safety precautions at all times while performing these steps. Always wear argon safety glasses.

Procedure

1. Pre-Installation Inspection
 - a. Set the laser to STAND-BY mode.
 - b. Close laser shutter.
 - c. Remove the fiber from the instrument.
 - d. Position the fiber approximately 12" (30cm) from a diffuse white target.
 - e. Open the laser shutter.
 - f. Examine the beam pattern for a uniform circular beam.

- g. If a uniform circular beam is observed, proceed to Installation, Step 2.2. If concentric rings, multiple patterns or any other distortions are observed, go to Cleaning Procedure, Step 2.4 and then repeat Steps 2.1.1 through 2.1.6 one time.
 - h. If concentric rings, multiple patterns or any other distortions are still observed, the fiber is damaged and a new fiber must be inspected.
2. Installation
- a. Set the laser to STAND-BY mode.
 - b. Close laser shutter.
 - c. Soak a cotton swab with 100% Methanol.
 - d. Clean the fiber receptacle with the soaked cotton swab.
 - e. Insert the fiber into the receptacle in the optical assembly ensuring the fiber face does not come in contact with the flat surface in between the threaded ring and the receptacle bore.
3. Installation Inspection
- a. Open the laser shutter.
 - b. Place a beam-blocking device into the beam path between the spherical lens and the cylindrical lens mount.
 - c. If a uniform circular beam is observed, installation is complete. If concentric rings, multiple patterns or any other distortions are observed, go to Cleaning Procedure, Step 2.4 and then repeat Steps 2.3.1 through 2.3.2 one time.
 - d. If concentric rings, multiple patterns or any other distortions are still observed, the fiber is damaged and a new fiber must be installed.
4. Cleaning Procedure
- a. Set the laser to STAND-BY mode.
 - b. Close laser shutter.
 - c. Soak a piece of lens tissues with 100% methanol.
 - d. Clean the fiber face with soaked lens tissue.
 - e. Dry the fiber face with a second piece of lens tissue.
 - f. Open the laser shutter.
 - g. Perform appropriate Inspection (pre-installation or installation).
 - h. If a uniform circular beam is observed, return to appropriate step. If concentric rings, multiple patterns or any other distortions are still observed, perform steps 2.4.1 through 2.4.5 one time.
 - i. If concentric rings, multiple patterns or any other distortions are still observed, the fiber is damaged and a new fiber must be inspected.

Final Set-Up / Adjustment Procedures

According to UBI Operational Instruction: OI 109, Final Set-Up / Adjustment Procedures Instructions, Revision No. 3, (Last revision date: 11/09/01)

Purpose: The purpose of this OI is to list and describe the steps required to prepare a system for Final Test. Before each COPAS BIOSORT instrument is delivered to a customer, the system is tested according to the following procedures and should never need to be performed on site by a customer. Some references to internal Union Biometrica documents are made, for a copy of the referenced document, please contact the factory.

Set Up

1. Instrument
 - a. Attach all cables and visually inspect system.
 - b. Turn ON system
 - c. Set power supply DC voltage output for 5.10vdc on sorter board as follows:
 - d. Using Out1 voltadj, place meter on power connect J12 (Black to Black and Red to Orange).
 - e. Adjust meter reading to 5.11.
 - f. Check cap #C171 located below Serial Number Prom. Meter must read 5.10.
 - g. Set the mixer stepper motor drive current on the bulkhead board as follows:
 - h. Place a meter across C5 on bulkhead board.
 - i. Adjust DC voltage output using POT1 for a meter reading of $0.250v \pm .005v$.
 - j. 635nm Laser:
 - k. Verify switch #3 from bottom on the Laser Dipswitch SW1 (located on the bulkhead board) is ON (to the left).
 - l. 670nm Laser:
 - m. Verify switch #1, #2, #3 from bottom on the Laser Dipswitch SW1 (located on the bulkhead board) is ON (to the left).
 - n. Set the dipswitches on the waste pump stepper motor to the following:

	BIOSORT	SELECT, PLUS, XL
24/36v	ON	ON
1P/2P	ON	ON
F/H	OFF	ON
ACD	ON	ON

Set the dipswitches on the two stage drivers to the following:

	BIOSORT, SELECT, PLUS, XL
24/36v	ON
1P/2P	ON
F/H	OFF
ACD	ON

- o. Clean all bottles. Fill sheath bottle and backwash bottle with Sheath Reagent.
 - p. Check the sample cup position.

2. Computer
 - a. Turn ON computer and install PCI BUS Ether Netcard per OI 110.
 - b. Install COPAS System Software using Installation Disk.
 - c. Install Source Disk and open Key Maker.
 - d. Enter System ID number and options. The system will issue a new registration code.
 - e. Highlight and Ctrl+C the new registration code.
 - f. Open the system software. Open About MC menu and select Registration.
 - g. Place the cursor in the registration code box and hit Ctrl+V. Ensure the new registration code has been inserted. Verify the System ID number matches the number in Key Maker.
 - h. Right click on the COPAS icon. Select Property, select Find Target, and Select mc.ini.
 - i. Verify that the correct values are set in the ini.file according to the attached examples. Open the file menu and select save.
 - j. Perform the following set up on computer:
 - k. Initialize Network Port Enable
 - l. Select System Printer
 - m. Install WINMDI, POWERWARE, Registration Code and Communications Port Software from UnioBio system folder.
3. Argon Laser
 - a. Plug Argon Laser into correct voltage.
 - b. Move yellow wire on panel meter to top right-hand position (2 decimal points) of connector.
 - c. Turn ON AC power.
 - d. Verify 2 decimal points on LCD.
 - e. Power up the computer and open the program by double clicking on the COPAS Icon. Open TOOLS Menu and select "Run External Laser". Turn laser on in Run Mode.
 - f. Set laser power to 10 ± 2 mW on the laser power supply by placing a laser meter, set to 488nm, between the laser and cylindrical lens and adjusting the Int Adj located in the bottom of the Argon laser.
 - g. Set the Argon laser readout to within ± 1 mW of the laser power recorded in step 3-E by adjusting POT 3, DVM ADJ.
 - h. Set main screen laser power to within ± 1 mW of the laser power recorded in step 3-E by adjusting POT 1, MON GAIN.
 - i. On the main computer screen, open TOOLS Menu and select "Run External Laser". Change laser to the Standby Mode.
 - j. With the laser power meter still in place, record the laser power.
 - k. Compare the Argon laser readout and the main screen laser power to the laser power meter.
 - l. Adjust the three readings to be as close as possible.
 - m. Set the laser back into Run Mode and verify the three readings in Run Mode still meet the ± 1 mW specification. If not, readjust to be within specification and repeat steps 3-I through 3-M.

Software Verification

1. With computer powered up, verify the following:
 - a. WINMDI software present
 - b. Powerware software present
 - c. Registration Number corresponds with System Type and Serial Number.
 - d. INI.file values set according to attached samples.

Fluidics Check

1. Measure the length of the waste pump tubing.
2. Connect and turn ON External Waste Pump, if applicable.
3. Add approximately 20ml of filtered bleach to Sample Cup.
4. Select START and allow the system to pressurize. Adjust the pressures to the following based on the size of the flow cell:

250μ	
Sheath	4.0 – 5.0
Sample	5.0 – 7.0
Sorter	3.0 – 4.0
Cleaning	10.0 – 11.0

500μ	
Sheath	2.5 – 3.5
Sample	1.2 - 1.8
Sorter	3.0 – 4.0
Cleaning	10.0 – 11.0

1000μ	
Sheath	4.0 – 5.0
Sample	2.0 – 3.0
Sorter	3.0 - 4.0
Cleaning	10.0 – 11.0

5. Select Pressure OK.
6. Select Sample Valve and run until cup is empty.
7. Rinse Sample Cup with distilled water three times.
8. Fill sample Cup with distilled water and run until cup is empty.
9. Refill Sample Cup with distilled water.
10. Turn Sheath Valve ON and check for flow.
11. Turn Sample Valve ON and check that the valve opens and closes. Ensure that there are no leaks.
12. Turn Sample Valve OFF.
13. Select Clean and verify flow increases through sheath tubing.
14. Turn Sheath Valve OFF.
15. Verify mixers are spinning.
16. Turn Sheath Valve ON and Measure the flow rate. Adjust the sheath pressure to obtain a flow rate as follows:

250μ
9-10 ml/min

500μ
20-25 ml/min

1000μ
30-35 ml/min

Laser Power Adjustment

1. Using a Laser Power Meter set to 635nm, place the power paddle between the laser and the cylindrical lens until the maximum meter reading is located.
2. Adjust the screw on the POT located on the laser supply board to obtain EXT voltages as follows:

250μ 2.5 – 3.0 volts	500μ 1.0 – 1.5 volts	1000μ 2.5 – 3.0 volts
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within an approximate laser power range of:

250μ 0.75 – 1.25 mW	500μ 1.5 – 2.5 mW	1000μ 0.5 - 1.0 mW
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Optical Fine Tuning

NOTE: Use proper laser safety precautions at all times while performing these steps.

1. Connect channel 1 on the oscilloscope to the EXT Test Point on the Pre-Amplifier.
2. Connect channel 2 to the Green PMT.
3. Set up the oscilloscope using a 1X probe with settings of 1.00 v on both channels and 25.0 ms.
4. Fill Sample Cup with appropriate beads and Turn Sheath and Sample Valves ON.
5. Turn the flow cell adjuster screw on the optical assembly to obtain maximum peak height on the oscilloscope.
6. Move the Cylinder Lens toward the flow cell to obtain the narrowest peak (~ 25μsec wide) with rounded bell-shaped curve. Do not allow the top of the peak to flatten.
7. Remove the EXT detector and place the mask onto the optical assembly.
8. Align the sensor mask by centering the red line on the laser beam.
9. Place the rod holder, spacer and EXT detector onto the optical assembly.
10. Print a copy of the ini.file and place into the DHR.

Diverter Alignment

1. Position the Sorter Valve ~ 1 stream diameter away from the flow stream.
2. Turn sheath valve and sorter valve ON.
3. Looking directly at the spray of sheath, adjust both the front and back diverter adjustment screws until the spray is centered.
4. Adjust the Sorter pressure to obtain a stream deflection of ~ 30° from vertical.

Waste Tray Alignment

1. Turn the waste tray adjuster screw counterclockwise and push the tray toward the right as far as it will go.
2. Turn the sheath valve ON and Sorter Valve OFF.
3. Turn the screw clockwise until a stream of sheath just flows through the opening. Ensure the stream is flowing straight.
4. Turn the Sorter Valve ON and check that no dripping occurs.
5. Verify that the stream hits the waste tray just after the bend in the metal plate.

Stage Alignment

1. Open the TOOLS menu and select Align Stage.
2. Place a 96 well plate onto the stage.
3. Click the WELL A1 button and then click the TEST DROP button to verify that the test drop has been deposited neatly into the correct well.
4. Adjust the alignment by changing the <OUT IN> and <LEFT RIGHT> positions by increasing or decreasing amount of steps if the stage positioning is incorrect. This may be done using the arrow buttons next to each of these fields. Repeat the TEST DROP procedure until the drop falls in the center of the well.
5. Click the NEXT COL or NEXT ROW buttons to allow for additional positions to be checked. Continue through at least ½ of the first row of the 96 well plate.
6. Click the LAST WELL button and then click the TEST DROP button again to verify correct stage alignment.
7. Return to WELL AT A1 and verify drop is still in center of well.
8. Repeat the above alignment procedure using LOAD B and WELL B1 for aligning the B side of stage if necessary.
9. Observe the droplet formation and verify there is no more than 1 satellite drop. If a satellite drop is present, it must fall within the well area. If there is more than 1 satellite drop, troubleshoot and repeat DROP TEST. Click the DONE button, which will return the view to the COPAS software main screen.
10. Save the stage alignment upon exiting the program. The alignment will be saved in the COPAS system software.

PMT Set up

NOTE: Move the oscilloscope lead from PMT to PMT as appropriate to obtain necessary data.

1. Set Green and Red PMTs to 500 on computer main screen. Record voltage outputs from channel 2 on the oscilloscope.
2. Open TOOLS Menu and select SELECT PMT FILTERS. Change to Filter Set 2.
3. Set Yellow PMT to 500 on computer main screen. Record the voltage output from channel 2 on the oscilloscope.
4. Replace the 488nm filter with the 514nm filter.
5. Open TOOLS Menu and select SELECT PMT FILTERS. Change to Filter Set 3.
6. Ensure the Red and Yellow PMTs are set at 500 on the computer main screen. Record voltage outputs from channel 2 on the oscilloscope.
7. Replace the 514nm filter with the 488nm filter.
8. Adjust red PMT on computer main screen to obtain a voltage output of 1.5 volts on the oscilloscope.
9. Adjust Yellow PMT on computer main screen to obtain a voltage output of 1.5 volts on the oscilloscope.
10. Open TOOLS Menu and select SELECT PMT FILTERS. Change to Filter Set 1.
11. Adjust Green PMT on the computer main screen to obtain a voltage output of 1.5 volts on the oscilloscope.

COPAS Instrument Test

According to UBI Procedure: 350-5000-TPR, COPAS BIOSORT Test Procedure, Revision No. 2
(Last revision date: 9/26/01)

Instrument Set-Up

1. Ensure air supply is connected to the instrument and turned ON. Set pressure to 20-25 psi.
2. Turn ON instrument main power and laser power supply.
3. Turn ON computer and record the following:

E-Prom Number: _____
Instrument Serial Number: _____
Registration Number: _____
Software Rev: _____
Firmware Rev: _____

4. Measure laser power.
Start the instrument and document the laser power from the main screen and the laser power supply.

Specification

Blue Laser Power:	_____ mW	10 ± 1.0 mW
Main Screen Laser Power:	_____ mW	± 1.0 mW from Blue Laser
Power Supply Laser Power:	_____ mW	± 1.0 mW from Blue Laser
Red Laser Power:	_____ mW	0.8 – 1.05 mW

5. Set up pressures. Place approximately 4 L of BIOSORT Sheath Reagent (P/N 350-5071-000) into the sheath container and cap firmly.
 - a. Place approximately 4 L of BIOSORT Sheath Reagent (P/N 350-5071-000) into the sheath container and cap firmly.
 - b. Place approximately 200mL of distilled water into the secondary sample container and cap firmly.
 - c. Place approximately 500mL of BIOSORT Sheath Reagent (P/N 350-5071-000) into the cleanout bottle.
 - d. Select START on the main screen and wait approximately 1 minute for pressures to equilibrate.
 - e. Verify both stir bars are spinning. If not, turn mixer OFF, re-position stir bars and turn mixer back ON. If stir bars are still not mixing, troubleshoot instrument.
 - f. Make sure that all lines are air free.
 - g. Turn SORTER Pressure OFF. Measure the flow rate of the Sheath. The flow rate of the sheath must be 8 – 10 ml/min. Adjust pressure to obtain this flow.
Flow Rate: _____
Final Pressure: _____
 - h. Adjust sample pressure to obtain minimal counts/sec. Adjust the following, if necessary, and record final pressures.

NOTE: Sample pressure must be at least 1.0 psi greater than sheath pressure.

	<u>Settings</u>	<u>Actual</u>
Sheath	3.5 – 5.0 psi	_____
Sample	5.0 – 7.0 psi	_____
Sorter	3.0 – 4.0 psi	_____
Clean	9.0 – 11.0 psi	_____

Performance Set-Up

1. Select PRESSURE OK.
2. Open the FILE Menu and select the 96serp file.
3. Clean the Sample Cup, Sample Valve and Flow Cell.
According to UBI Procedure: OI 05, Sample Cup, Sample Valve and Flow Cell Cleaning, Revision No. A (Last revision date: 9/29/00)
 - a. Click OFF the SAMPLE VALVE checkbox.
 - b. Detach the sample tubing and remove cap from primary sample cup. Discard any remaining sample.
 - c. Fill primary sample cup with 40 mL of deionized/distilled water and firmly tighten the cap. Reattach sample tubing to the primary sample cup.
 - d. Re-check the SAMPLE VALVE checkbox.
 - e. Process the water until the sample cup is empty.
 - f. Click OFF the SAMPLE VALVE and SHEATH VALVE checkboxes.
 - g. Detach the sample tubing and remove cap from primary sample cup.
 - h. Fill primary sample cup with approximately Bleach solution, refer to Section 8.5.5 of the COPAS BIOSORT Operator's Manual for bleach concentration specifications, replace the cap and firmly tighten. Reattach sample tubing to the primary sample cup.
 - i. Select the Acquire button and process the bleach for approximately 10 minutes.
 - j. Click OFF the SAMPLE and SHEATH VALVE checkboxes.
 - k. Detach the sample tubing and remove cap from primary sample cup.
 - l. Fill the primary sample cup with 40 mL of deionized/distilled water.
 - m. Aspirate deionized/distilled water and discard.
 - n. Fill primary sample cup again with 40 mL of deionized/distilled water and firmly tighten the cap. Re-attach sample tubing to the primary sample cup.
 - o. Select the Acquire button and process the deionized/distilled water for approximately 10 minutes. Do not allow the sample cup to run dry.
 - p. Click STOP twice. The system is now cleaned.
 - q. Clean external surfaces of any spillage using a water dampened lint free cloth.
4. Place approximately 20 mL of BIOSORT CONTROL BEADS (P/N 310-5071-000) into the primary sample cup and cap firmly.

5. Set PMTs as follows:

PMT Control		
Green	Yellow	Red
500	500	500

6. Connect oscilloscope to the Green PMT and adjust the voltage to 1.5 volts using the PMT Control.

7. Connect the oscilloscope to the Red PMT and adjust the voltage to 1.5 volts using the PMT Control.
8. Open the TOOLS Menu and select "SELECT PMT FILTERS". Choose Filter Set 2, Green and Yellow, and restart the external laser.
9. Connect the oscilloscope to the Yellow PMT and adjust the voltage to 1.5 volts using the PMT Control.
10. Record the final PMT values.

PMT Control		
Green	Yellow	Red

11. Open TOOLS menu and select RUN CONTROL PARTICLES.
12. Adjust sample pressure to obtain 10 ± 2 beads/sec by selecting ACQUIRE to begin particle flow. Collect beads for 1 minute and calculate the mean rate of the beads.

Total		<u>Specification</u>
Mean Rate		10 ± 2 / sec
(Total /60)		
Sample Pressure:		

13. Select ACQUIRE and process at least 1000 events.
14. Record the Means and C.V.s of the beads. If not within specification, troubleshoot instrument and repeat steps 2.6 through 2.8.
15. Print the display screen and attach to this document.

Particle Lot No: _____

Expiration Date: _____

Mean		Spec
TOF		15 - 25
EXT		28 - 54
FLU1		7 - 73
FLU2		7 - 73

C.V. %		Spec
TOF		≤ 9.0
EXT		≤ 11.0
FLU1		≤ 20.0
FLU2		≤ 20.0

16. Clean sample cup, sample valve and flow cell following the procedure outlined under the Performance Set Up step number 3 found in the COPAS Instrument Test section of this Service Manual.

Performance Verification

- Place approximately 40mL of sample (*C. elegans* sample is recommended) into the primary sample cup and cap firmly.
- Open the FILE Menu and select the 96serp file.
- Set the instrument sort delay and sort width:
 - Select number of events to be sorted per well by entering the desired value (between 0 and 50,000) in the Per Well field located on the main software screen.
 - Set the Sort Delay by starting with a recommended value of 8 and adjust the setting up or down in increments of 0.5 until optimal sort results are achieved.
 - Set the Sort Width by starting with a recommended value of 5 and adjust the setting up or down in increments of 1.0 until optimal sort results are achieved.

NOTE: The sort width must be less than the sort delay.

 - Ensure Coincidence Check checkbox is checked, indicating it is ON if desired.
- Set the following GAINS and SORT PARAMETERS and record actual values (if applicable).

Full Scale		Actual
TOF	256	
EXT	256 or 512	
FLU1	256 or 512	
FLU2	256 or 512	

	Signal	Integral
EXT	80	100
FLU1	80	200
FLU2	80	200

Thresholds
Signal
50
TOF Minimum
20

PMT Control					
Green	Actual	Yellow	Actual	Red	Actual
500-600		N/A	N/A	600-700	

- Adjust the sort parameters to the following:

	Sort Parameters	
Sort Delay	8 ± 1.0	
Sort Width	5 - 7	
Per Well	1	
Coincidence	ON	

- Ensure 10 ± 2 events (worms)/sec. If rate is above this target, dilute sample to achieve this rate.
- Print screens of dot-plots showing TOF vs. EXT and EXT vs. FLU.

8. Adjust markers on EXT vs. FLU to gate approximately 60% of the worms. Record actual value.

Gate Value (%) _____ %

Record the Sort Region:

	<u>Low</u>	<u>High</u>
# of Events	_____	_____
TOF	_____	_____
EXT	_____	_____
FLU1	_____	_____
FLU2	_____	_____

9. Place 96 well tray onto stage and Select LOAD PLATE.

10. Select FILL PLATE and start timer. Upon completion of plate filling, record the time in seconds.

	<u>Specification</u>
Time (S) _____	≤ 105 Seconds

11. Print the display screen and attach to this document.

12. View full tray with a microscope using a 4X or 10X objective. Record results on Worksheet.

	<u>Specification</u>
# of wells with < 1 worm _____	≤ 2
# of wells with > 1 worm _____	≤ 3

13. Change “Per Well” to 5 and select ACQUIRE to begin particle flow.

14. Place 96 well tray onto stage and Select LOAD PLATE.

15. Select FILL PLATE and start timer. Upon completion of plate filling, record the time in seconds.

	<u>Specification</u>
Time (S) _____	≤ 180 Seconds

16. Print the display screen and attach to this document.

17. View first 24 wells with a microscope using a 4X or 10X objective. Record results on Worksheet. Refer to Section 7.13, Sort Parameters in the Operator’s Manual to learn more and if results are not within specifications.

	<u>Specification</u>
# of wells with < 5 worms _____	≤ 2
# of wells with > 5 worms _____	≤ 3
Testing Performed By: _____	
Date Performed: _____	

Sorter Operation Verification

1. Turn Sheath and Sample Valves ON.
2. Set SORTER Pressure to 3.0.
3. Place a microscope slide under the sort hole on the waste tray and run for a minimum of 1 minute.
4. Inspect the microscope slide for spray.
5. Spray Visible Yes / No
If No, proceed to step 6. If yes, follow the below troubleshooting steps.
 - a. Check sheath and sample containers. Verify they are filled appropriately.
 - b. Check sheath and sample pressures. Verify they have reached the specified levels.
 - c. Check the waste container. Verify it is draining properly.
 - d. Check the waste tray. Verify it is pushed all the way to the right.
 - e. Check the outlet nozzle. Verify that liquid has not accumulated around the nozzle. If it has, perform the following:
 - Remove the waste tray.
 - Soak up excess liquid around the nozzle with the tip of a paper tissue.
 - Return the waste tray to position, observe if spray is still present.
 - f. Check the flow cell for a clog. Clear the flow cell by performing the following:
 - Click the CLEAN button several times.
 - Place a finger over the vent on the sheath bottle cap and then remove it, this action will temporarily increase sheath pressure. Observe pressures while performing this action and be sure not to exceed recommended pressures.
 - Turn sample valve off and click the sheath valve several times, opening and closing the valve. Often these steps are effective in dislodging the clog and re-starting the flow.
 - g. Use the stylus to remove any potential clogs in the flow cell and in the case that previous steps failed to remove the clog.

NOTE: Always inspect stylus prior to inserting into the flow cell as damage may result if the stylus is bent or cut.

 - Remove sample tubing from the flow cell, taking care to not pull on the flow cell.
 - Insert the stylus into the flow cell, while gently twisting. If resistance is felt STOP, lift the stylus approximately 2mm and insert the stylus again. Repeat this as necessary until the stylus exits the flow cell without any resistance.
 - Raise and lower the stylus a few times while making small circles with the stylus at the bottom of the flow cell.
 - Remove the stylus and reconnect the sample tubing.
 - Select the CLEAN button 2 – 3 times.
 - h. If this procedure has not eliminated the visible spray, please contact factory for assistance.
6. Check the drops for evidence of large worms using a microscope.

Instrument Preparation

1. Remove sample from primary sample cup.
2. Add 40ml of COPAS Cleaning Solution to the primary sample cup and cap firmly.
3. Select Sample Valve for approximately 5 minutes.
4. Rinse primary sample cup with distilled water twice.
5. Fill primary sample cup with distilled water and cap firmly.
6. Select Sample Valve for approximately 5 minutes.
7. Fill sample with distilled water and close cap.
8. Close software and turn off power to system and components.

Installation Performed By: _____

Date: _____

Instrument Test Worksheets

Sort Delay
Value

	1	2	3	4	5	6	7	8	9	10	11	12
A												
B												
C												
D												
E												
F												
G												
H												

Sort Delay

Date _____

Technician _____

	1	2	3	4	5	6	7	8	9	10	11	12
A												
B												
C												
D												
E												
F												
G												
H												

1 / Well

Date _____

Technician _____

	1	2	3	4	5	6	7	8	9	10	11	12
A												
B												

5 / Well

Date _____

Technician _____

Daily / Short Term COPAS Instrument Maintenance

The following Daily Maintenance procedure (also found in the Operator's Manual) should be performed by the Operator at least once daily when the instrument is in use. If the COPAS BIOSORT will be idle for one to two weeks, follow the short term maintenance schedule outlined in the Operator's Manual. If the COPAS BIOSORT will be idle for greater than two weeks, it is recommended that the short term maintenance schedule also be followed.

The following maintenance worksheets are found in the APPENDIX section of the Operator's Manual.

- Daily Performance Log Sheet
- Maintenance Log Sheets: Daily, Short / Long Term Shutdown, Sterilization
- Troubleshooting Log Sheet

Union Biometrica recommends that these be used to store important instrument information. Recording performance data regularly can aid in the identification of subtle shifts in readings, which may indicate system problems. Please make copies of these maintenance worksheet pages as needed.

Daily Maintenance Procedure

NOTE: Do NOT leave sample or Cleaning Reagent in the instrument over night.

1. Click OFF the SAMPLE VALVE checkbox.
2. Detach the sample tubing and remove cap from primary sample cup.
3. Discard any remaining sample.
4. Fill primary sample cup with approximately 25 mL of Cleaning Reagent. Replace the cap and firmly tighten.
5. Clean the secondary sample container, if used, as follows:
 - a. Add 200 mL of Cleaning Reagent to the secondary sample container.
 - b. Detach the aerators and re-cap the container.
 - c. Shake the container to clean the interior surfaces.
 - d. Empty the Cleaning Reagent from container and rinse the container thoroughly with deionized/distilled water. Visually inspect the container for any remaining sample residue.
 - e. Add 200 mL of deionized/distilled water to the container.
 - f. Clean and reattach the aerators. Replace the cap and firmly tighten.

NOTE: Do not put Cleaning Reagent into the secondary sample container while pressure is on. Foaming will occur.

NOTE: The secondary sample container may also be washed in a dishwasher or autoclaved if preferred.

6. Attach sample tubing to the primary sample cup.
7. Re-check the SAMPLE VALVE checkbox. The warning message, “Caution, this Operation will contaminate the Flow Cell if Sample is Present”, will appear. Click OK.
8. Process the Cleaning Reagent until the sample cup is empty.
9. Click OFF the SAMPLE VALVE checkbox.
10. Detach the sample tubing and remove the cap from primary sample cup.
11. Fill the primary sample cup with 40 mL of deionized/distilled water.
12. Aspirate deionized/distilled water and discard.
13. Fill primary sample cup again with 40 mL of deionized/distilled water and firmly tighten the cap.
14. Attach sample tubing to the primary sample cup.
15. Select Acquire and process the deionized/distilled water for approximately 10 minutes. Do not allow the sample cup to run dry.
16. Click the STOP button twice.
17. Clean external surfaces of any spillage using a water dampened lint free cloth.

NOTE: Do not remove or clean any of the electrical connectors or cables of the COPAS BIOSORT.

Visual Tubing Check

Depending on the frequency of instrument use, it is recommended that a visual inspection of the system and tubing be made. If the instrument is used daily, it is recommended that the external tubing be inspected on a weekly basis, as this tubing will wear out through normal usage. Check the tubing for leaks, specifically around tubing joints. If you determine during the inspection that tubing looks worn or brittle, carefully remove it and replace it with new tubing. Once this has been done, perform the Fluidics Check found in the Final Set-Up / Alignment Procedures section of this Service Manual.

Annual Preventative Maintenance Procedure

(Revised 12-01-2001)

A trained Union Biometrica, Inc. Service Engineer typically performs this Preventative Maintenance Procedure at the annual preventative maintenance visit. As specified by the COPAS instrument warranty agreement, this procedure will be performed by Union Biometrica, Inc. at the end of the one year warranty period and/or at the end of a one year service contract period. Union Biometrica, Inc. recommends that this Preventative Maintenance Procedure be performed annually to maintain optimum instrument performance.

Customer Site: _____

Serial numbers of all system components: _____

Check off box when task is completed

- ☐ Run control Beads and record results at time of arrival to set base line.

	CVs	MEAN
EXT	_____	_____
TOF	_____	_____
GRNFL	_____	_____
YELFL	_____	_____
REDFL	_____	_____

- ☐ If system does not meet final test specifications, repair and then continue.
- ☐ Replace all sample tubing.
- ☐ Replace all o-rings on sample cup.
- ☐ Replace sample air tubing or sample air fittings.
- ☐ Check all tubing for leaks and wear.
- ☐ Run DI water as sample and check back round counts.
- ☐ Run control Beads and record results.

	CVs	MEAN
EXT	_____	_____
TOF	_____	_____
GRNFL	_____	_____
YELFL	_____	_____
REDFL	_____	_____

Check off box when task is completed

- ☐ Test sorting and record results.

Sorted Sample Type _____ Drop Delay ____ Sort Width ____ Coincidence ____

Sort 10 events for 12 wells. Record results: _____

Sort 1 event for 96 wells Record results: _____

- ☐ Check the performance and alignment of the Reflx option.

Sort 20 Events in every other well for 24 wells

Performance: % Yield _____

% Carry-over _____

% Left in well _____

- ☐ Measure laser output of each laser. He NE ____mw Argon ____mw other ____mw

- ☐ Measure Laser current at operating power. Current _____amps

- ☐ Replace air filter, check the performance and oil level on the air compressor.

- ☐ Computer

1. Remove all old files.

2. Run defragment program on the C: drive.

3. Conform that there is at lease 500 Megs of disk space free.

- ☐ Remove waste tray and clean.

- ☐ Check waste tray and diverter valve alignment.

- ☐ Check the performance and alignment of X-Y stage.

- ☐ Check the performance of twister and confirm twister alignment.

- ☐ Clean outer surfaces of complete system.

- ☐ If system is not performing to final test specifications then repair, return to step 2.

- ☐ Complete Field Service Report.

Customer Signature: _____

Date: _____

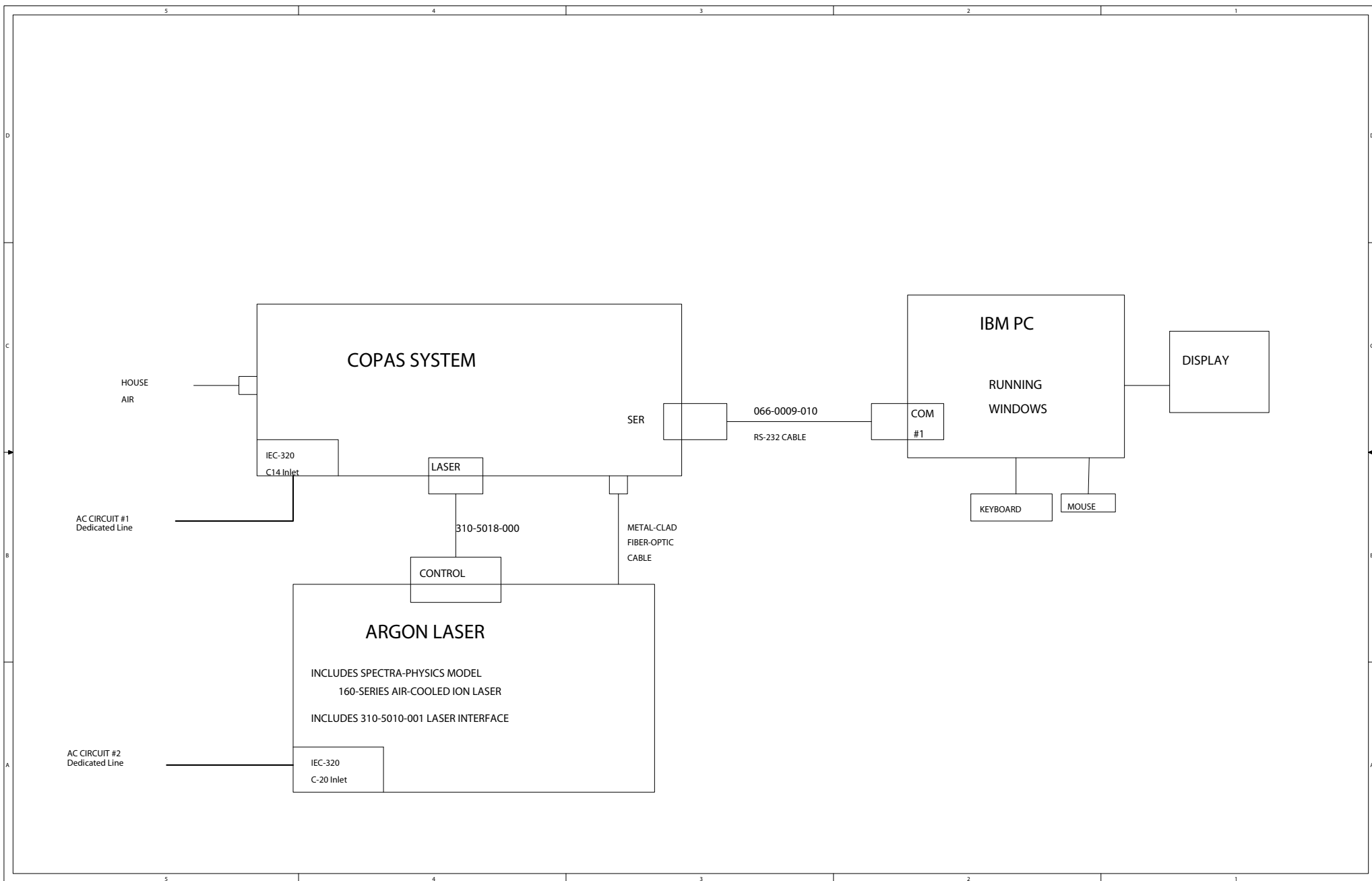
FSE Performing PM: _____

Date: _____

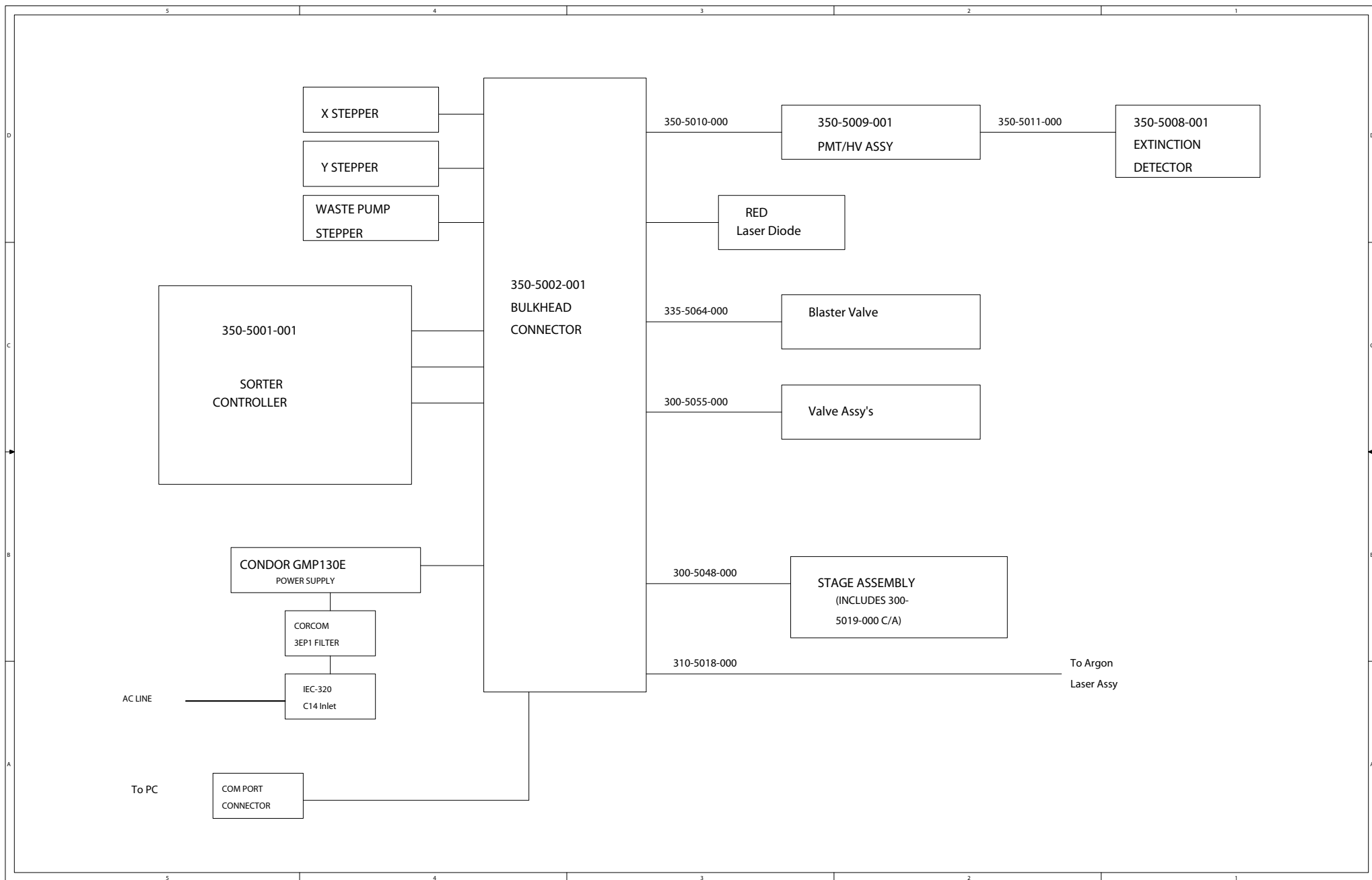
System Interconnect Drawings

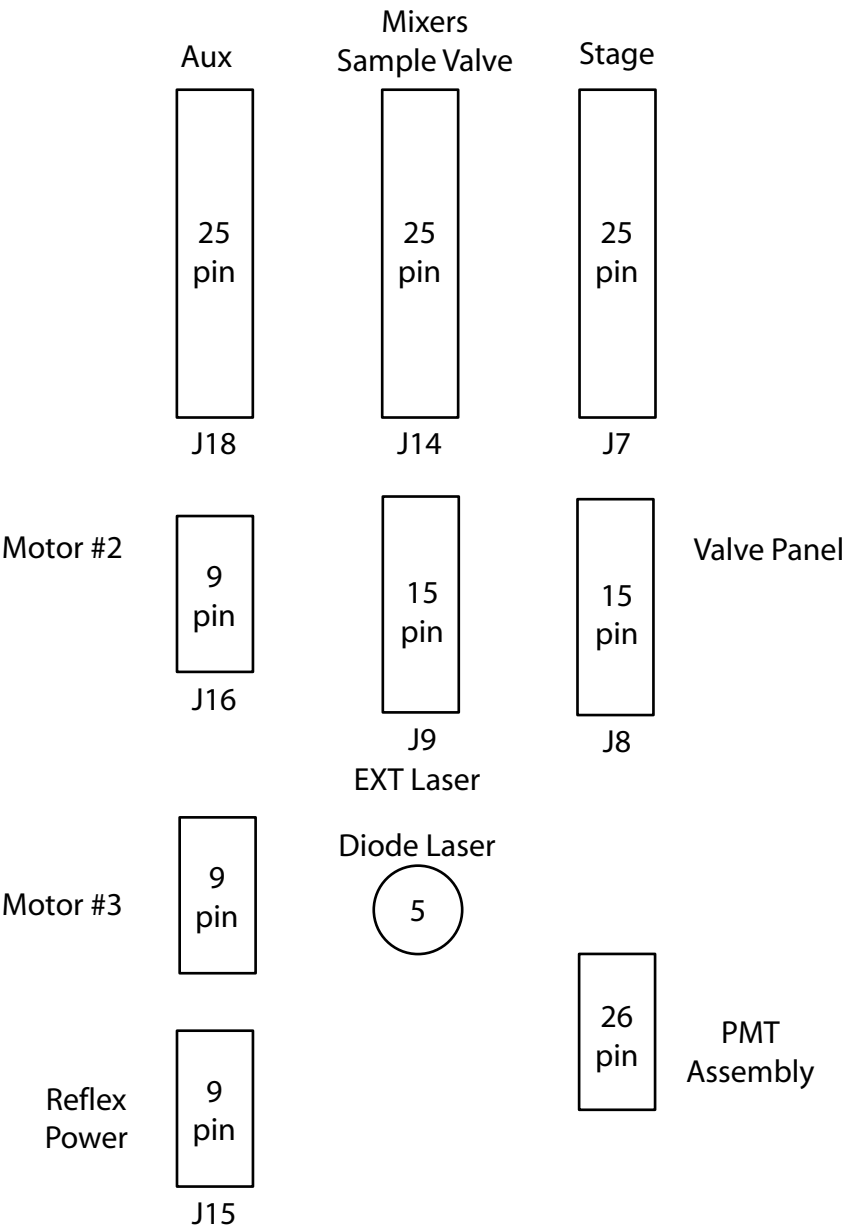
COPAS BIOSORT System Interconnect Top View
COPAS BIOSORT System Interconnect Internal
COPAS Connector Panel
COPAS Fluidic Diagram

Drawings matching these part numbers / descriptions immediately following this page.



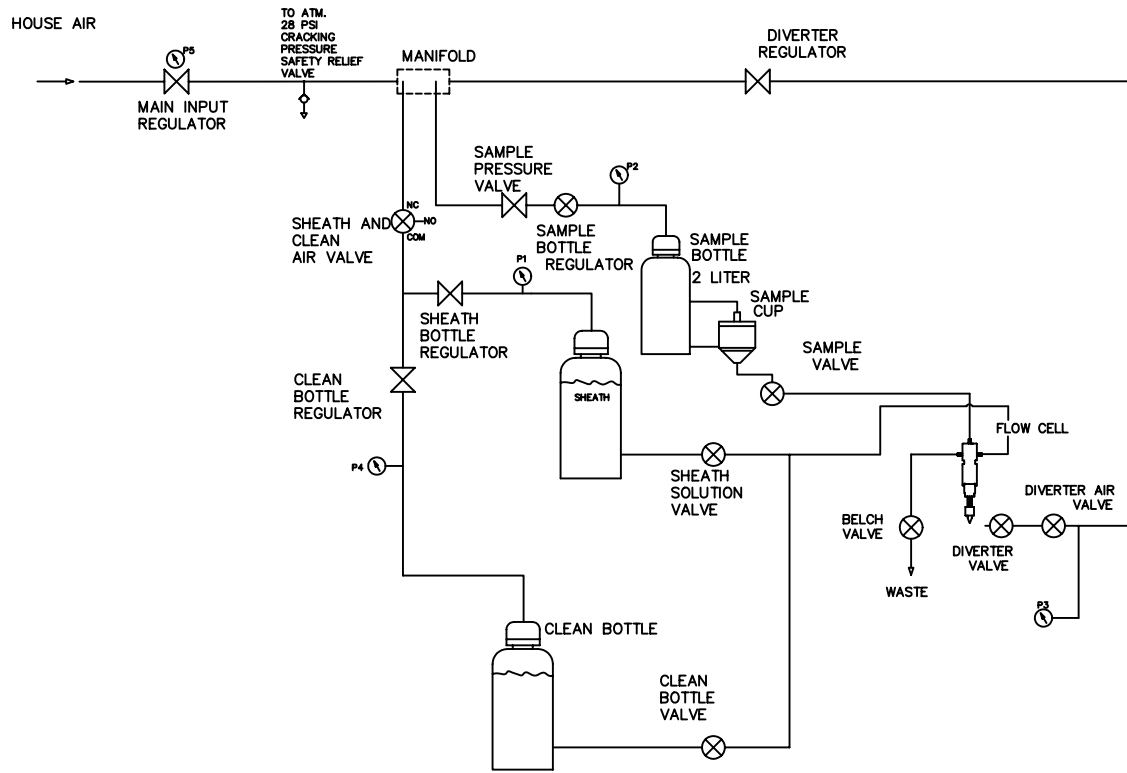
COPAS BIOSORT SYSTEM INTERCONNECT TOP VIEW





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REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
1	INITIAL WORKING DRAWING	04/03/02	M.P.S.	.



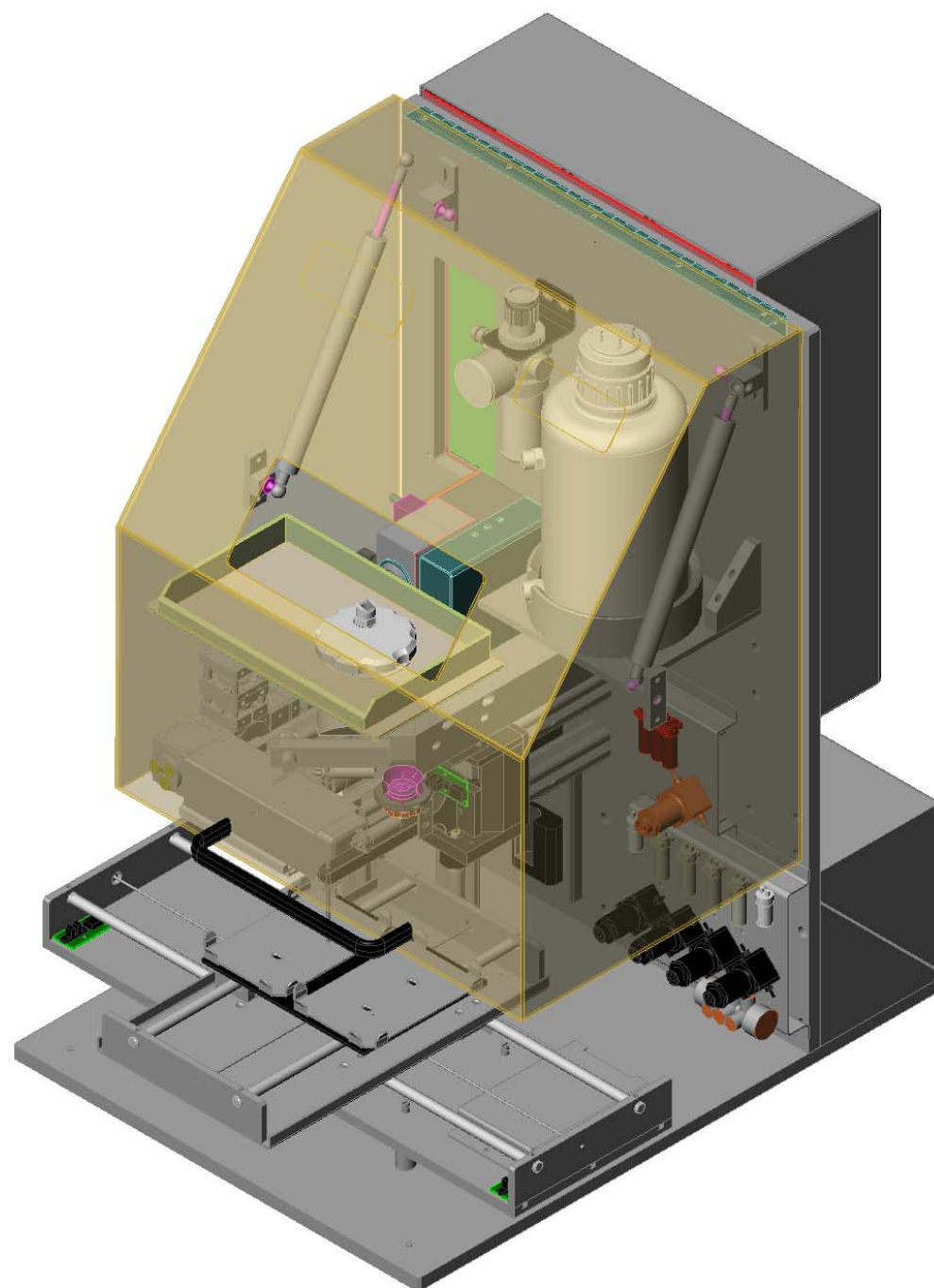
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES				DRAWN		M.OOWA		04/03/02		UNION BIOMETRICA INC.	
TOLERANCE ON				ENGINEER		KASSEY		04/03/02		SOMERVILLE, MA. (617) 547-7703	
ORIGINALS				APPROVED		.		.		PNEUMATIC DIAGRAM, COPAS	
CONCENTRICITY .005 TIR				PROJECT		ALUMINUM		QUALITY		SIZE	
HORIZONTAL SURFACES TO BE .32				APPROVED		.		.		D	
MICROFINISHES UNLESS NOTED.				MATERIAL		NONE		350-5000-XXX		REV	
350-5000-000				FINISH		NONE		1		1	
APPLICATIONS WHERE USED				SCALE 1 : 1		DO NOT SCALE THIS DRAWING		SHEET 1 OF 1			

General Parts List

The following general parts list includes all assemblies that comprise the COPAS BIOSORT, part number 350-5000-000. For a specific bill of material for an assembly, please contact Union Biometrica, Inc. directly.

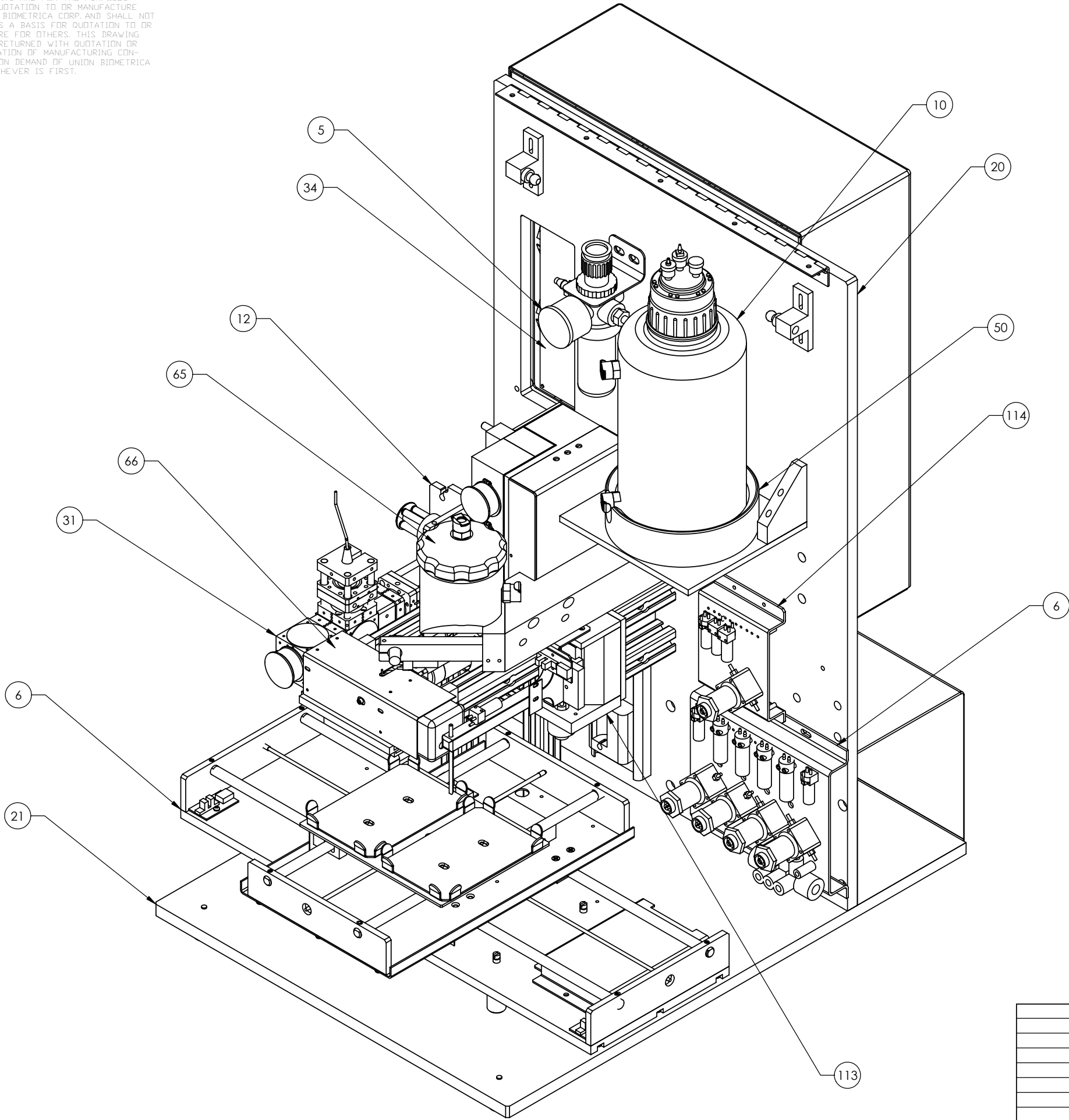
Part No.	Description
350-5000-000	COPAS BIOSORT
300-5036-000	Air / Regulator Filter, Assembly
300-5037-000	Valve Panel, Assembly
300-5059-000	Sample Bottle, Assembly
300-5061-000	Waste Tray, Assembly
300-5065-000	Waste Pump, Assembly
350-1001-000	Back Plate
350-1002-000	Base Plate
350-5020-000	Final Optics, Assembly
350-5027-000	System Electronics, Assembly
350-5041-000	Sample Bottle Support, Assembly
350-5039-000	Sample Cup, Assembly
350-5021-000	Argon Laser System, Assembly
350-5023-000	Laser Cover, Assembly
300-5018-000	XY-Stage, Assembly
340-5000-000	ReFlex Sampler, Assembly (Optional)
340-5001-000	ReFlex Sampler Valve Panel, Assembly (Optional)

Drawings matching these part numbers / descriptions immediately following this page.



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REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
1	INITIAL WORKING DRAWING	11/01/01	J.M.M.	XXX

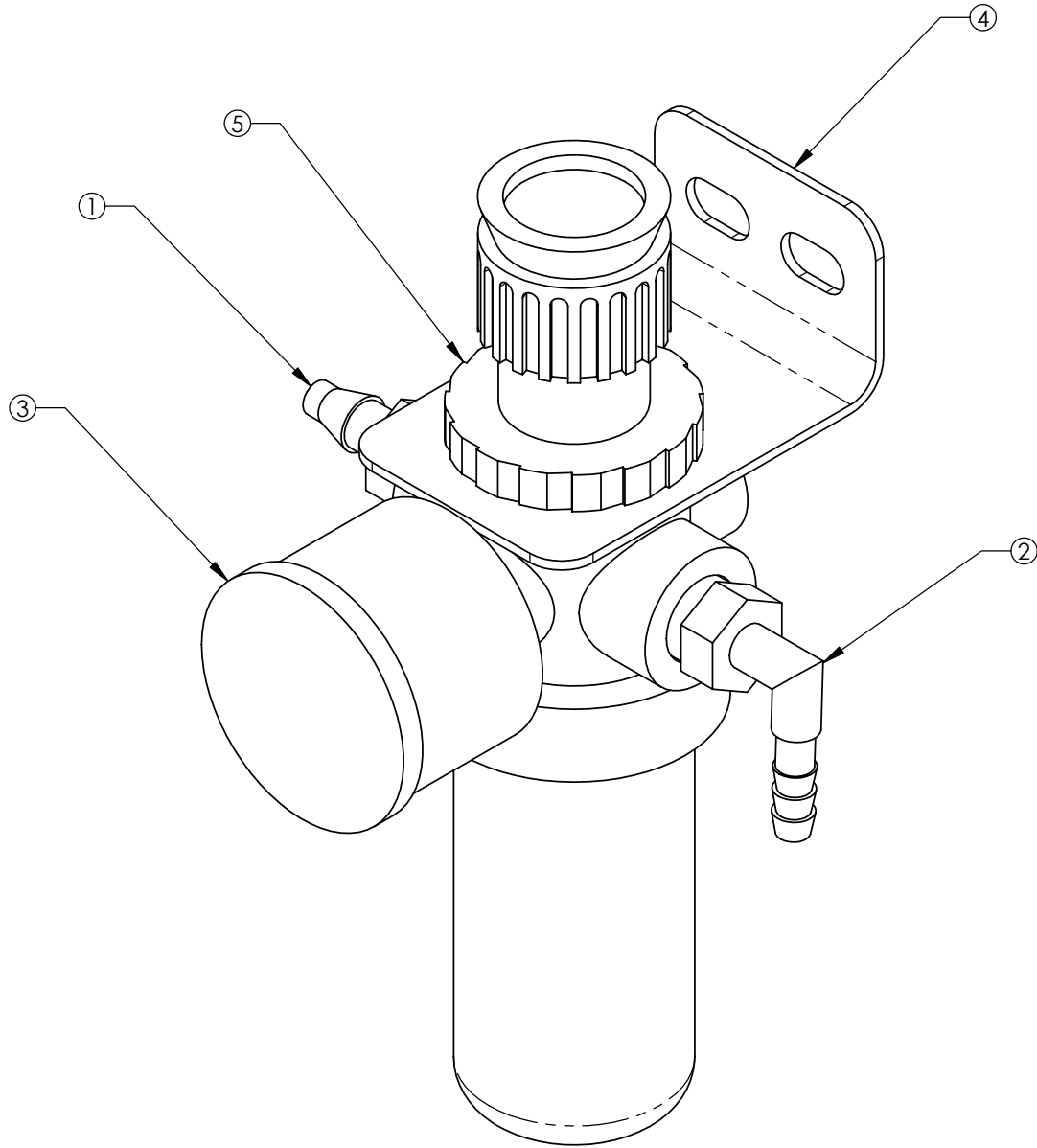


ITEM NO.	QTY.	PART NO.	DESCRIPTION
5	1	300-5036-000	AIR/REGULATOR FILTER, ASSY
6	1	300-5037-000	VALVE PANEL, ASSY
10	1	300-5059-000	SAMPLE BOTTLE, ASSY
11	1	300-5061-000	WASTE TRAY, ASSY
12	1	300-5065-000	WASTE PUMP, ASSY
20	1	350-1001-000	BACK PLATE
21	1	350-1002-000	BASE PLATE
31	1	350-5020-000	FINAL OPTICS, ASSY
34	1	350-5027-000	SYSTEM ELECTRONICS, ASSY
50	1	350-5041-000	SAMPLE BOTTLE SUPPORT, ASSY
65	1	350-5039-000	SAMPLE CUP, ASSY
66	1	350-5023-000	LASER COVER, ASSY
76	1	300-5018-000	XY-STAGE, ASSY
113	1	340-5000-000	REFLEX SAMPLER, ASSY (OPTIONAL)
114	1	340-5001-000	REFLEX VALVE PANEL, ASSY (OPTIONAL)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		DRAWN	J.MESSINA	11/01/01	UNION BIOMETRICA INC. SOMERVILLE, MA. (617) 547-7703	
TOLERANCE ON DECIMALS FRAC ANGLES .XX ± .010 ± ~ ± 30' .XXX ± .005		ENGINEER	KASSEY	11/01/01		
CONCENTRICITY .005 TIR REMOVE BURRS & SHARP EDGES. ALL FINISHED SURFACES TO BE .32 MICROINCHES UNLESS NOTED.		APPROVED	.	.	COPAS BIOSORT 250f	
MATERIAL		PROJECT ENGR	PROJECT	QUALITY ASSUR		
350-5000-000		ADDITIONAL COMMENTS: #			SIZE	REV
APPLICATION WHERE USED		FINISH			D	1
					SCALE 1 : 1	DO NOT SCALE THIS DRAWING
					SHEET 1 OF 1	

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REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
1	INITIAL WORKING DRAWING	06/12/02	.	

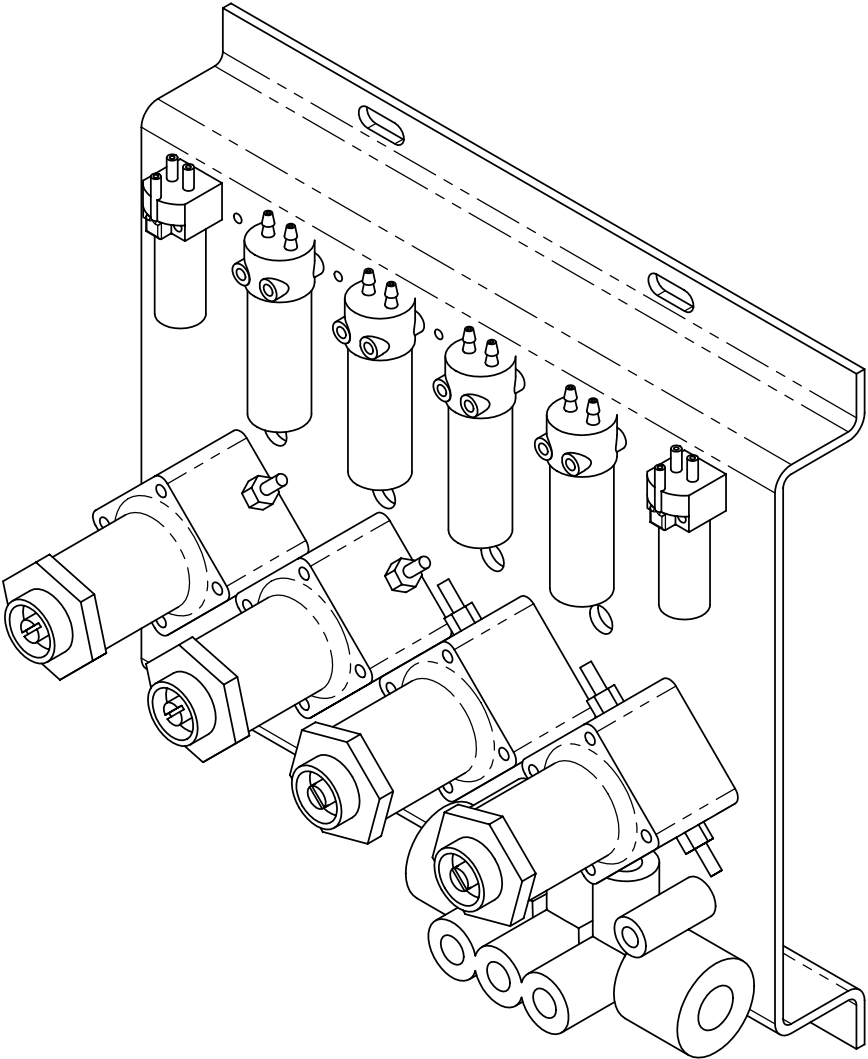


ITEM NO.	QTY.	PART NO.	DESCRIPTION
2	1	119-0002-001	FITTING, THREADED ELBOW
1	1	119-0003-000	FITTING, THREADED BARB
3	1	140-0002-000	FILTER/REGULATOR, AIR PRESSURE
4	1	140-0002-001	BRACKET, AIR FILTER
5	1	140-0002-002	PANEL NUT, AIR FILTER

	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON DECIMALS FRAC ANGLES .XX + .010 ± ~ ± 30' .XXX ± .005	DRAWN	J.MESSINA	06/12/02	UNION BIOMETRICA INC. SOMERVILLE, MA. (617) 547-7703				
		ENGINEER	KASSEY	06/12/002					
		APPROVED	.	.	TITLE: AIR/REGULATOR, FILTER, ASSEMBLY				
		PROJECT ENGR		QUALITY ASSUR				A.NAME	
		ADDITIONAL COMMENTS: X							
	MATERIAL	NONE				SIZE	PART NUMBER:	REV	
TOP LEVEL						C	300-5036-000	1	
APPLICATION WHERE USED	FINISH					SCALE:NONE		DO NOT SCALE THIS DRAWING	SHEET 1 OF 1

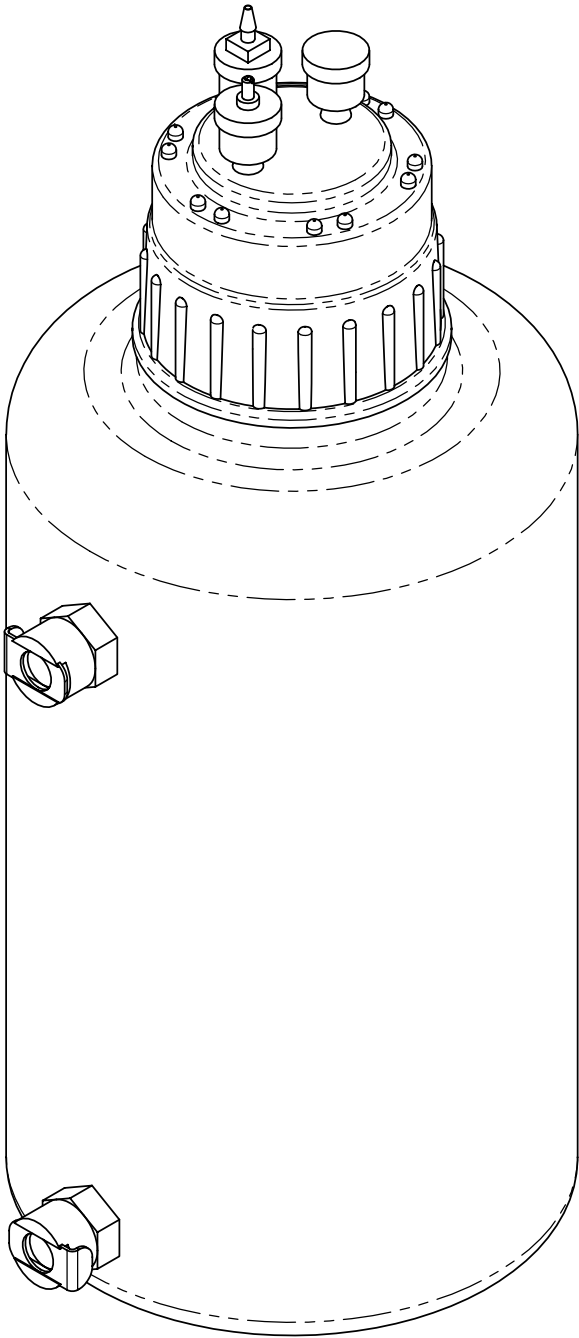
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REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
1	INITIAL WORKING DRAWING	04/24/03	J.M.M.	.
.



	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCE ON DECIMALS FRAC ANGLES ± .XX ± .010 ± ~ 30' ± .XXX ± .005	DRAWN	J.MESSINA	04/24/03	UNION BIOMETRICA INC. SOMERVILLE, MA. (617) 591-1211		
		ENGINEER	.	.			
		APPROVED	.	.	TITLE: ASSEMBLY, VALVE PANEL		
	CONCENTRICITY .005 TIR. REMOVE BURRS & SHARP EDGES. ALL FINISH SURFACES TO BE 32 MICROINCHES UNLESS NOTED.	PROJ. ENG.	QUALITY ASSUR.	.			
350—5000—000	MATERIAL: NONE	ADDITIONAL COMMENTS: .			SIZE B	PART NUMBER: 300-5037-000	REV 1
APPLICATION WHERE USED	FINISH: NONE				SCALE: 1 : 2	DO NOT SCALE THIS DRAWING	SHEET 1 OF 1

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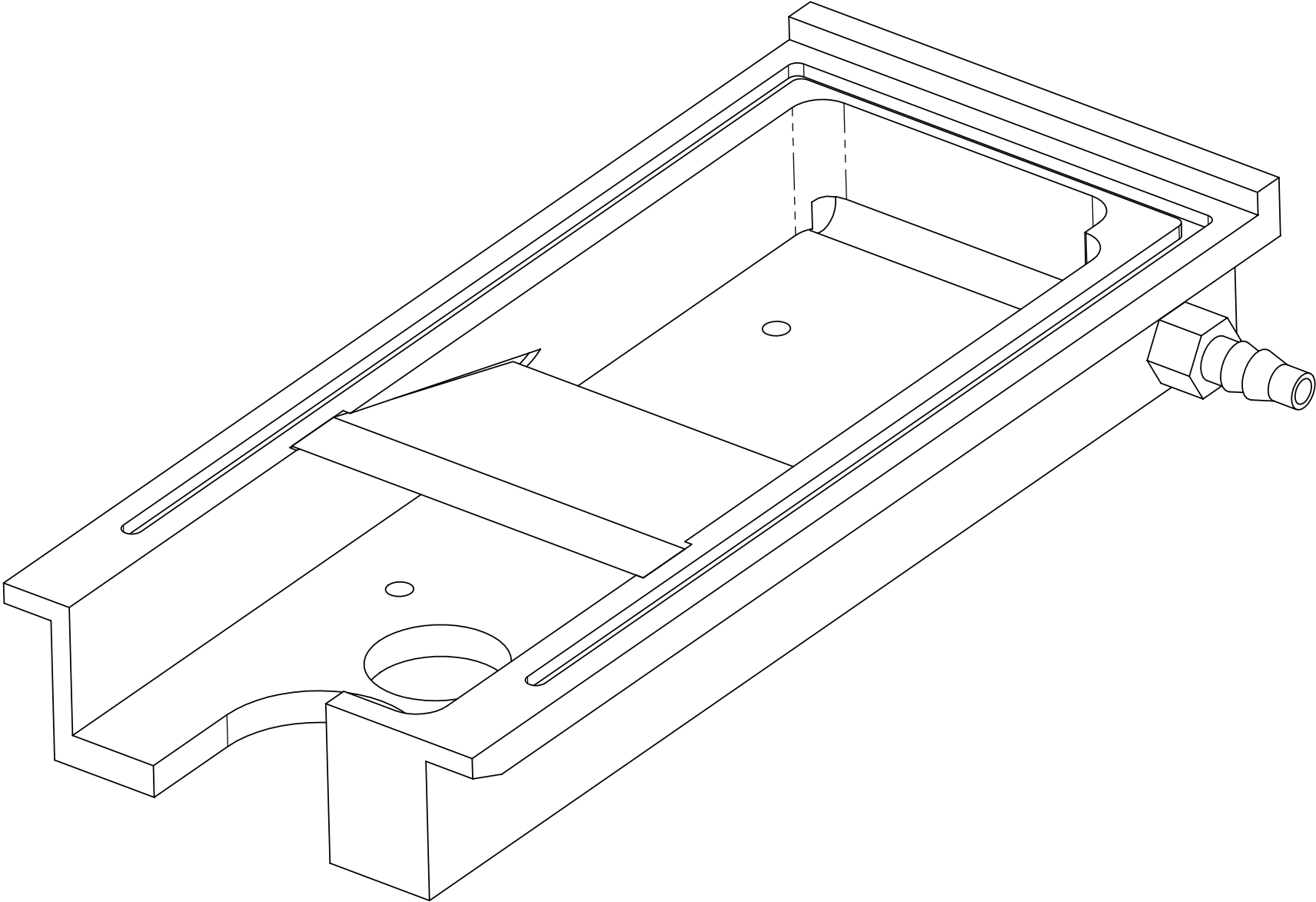


REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
1	INITIAL WORKING DRAWING	07/18/02	J.M.M.	.

	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON DECIMALS FRAC ANGLES .XX ± .010 ± ~ ± 30' .XXX ± .005	DRAWN	J.MESSINA	07/18/02	UNION BIOMETRICA INC. SOMERVILLE, MA. (617) 547-7703				
		ENGINEER	KASSEY	07/18/02					
		APPROVED	.	.	TITLE: ASSEMBLY, SAMPLE BOTTLE				
		PROJECT ENGR	.	QUALITY ASSUR					.
		ADDITIONAL COMMENTS: X							
	MATERIAL	NONE			SIZE	PART NUMBER:		REV	
350-5000-000					C	300-5059-000		1	
APPLICATION WHERE USED	FINISH	NONE			SCALE: 1 : 1		DO NOT SCALE THIS DRAWING	SHEET 1 OF 1	

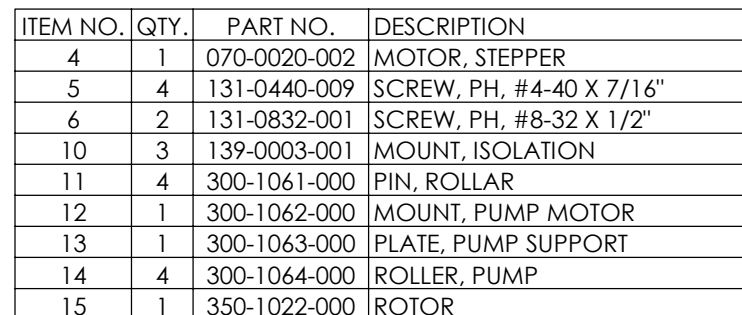
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REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
B	INITIAL WORKING DRAWING	07/19/02	J.M.M.	.
.



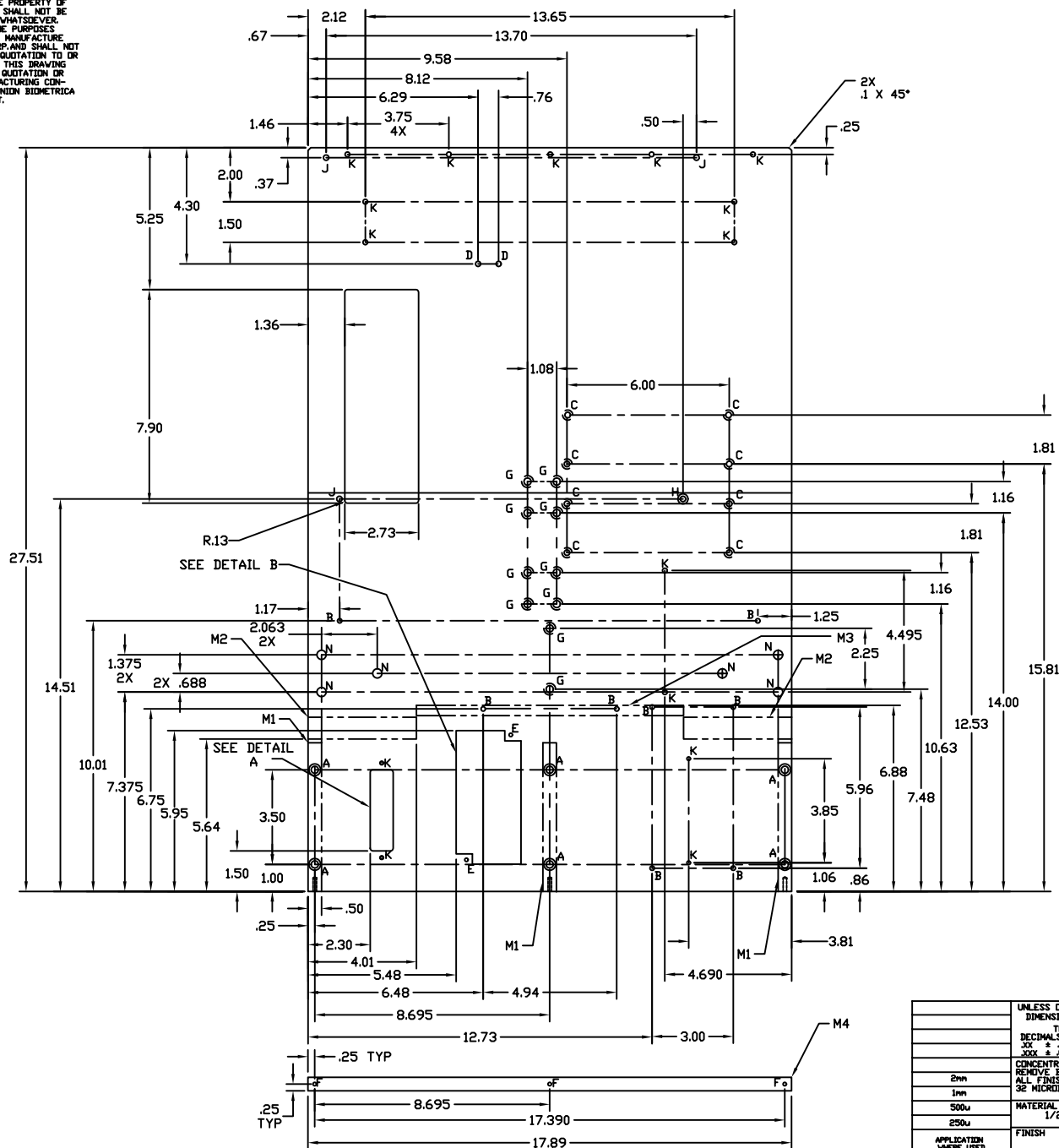
	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCE ON DECIMALS FRAC ANGLES ± .XX ± .010 ± ~ 30' ± .XXX ± .005	DRAWN	J.MESSINA	07/19/02	UNION BIOMETRICA INC. SOMERVILLE, MA. (617) 547-7703		
		ENGINEER	KASSEY	07/19/02			
		APPROVED	.	.			
370-5000-000	CONCENTRICITY .005 TIP. REMOVE BURRS & SHARP EDGES. ALL FINISH SURFACES TO BE 32 MICROINCHES UNLESS NOTED.	PROJ. ENG.	QUALITY ASSUR.		TITLE: WASTE TRAY, ASSEMBLY		
350-5000-000		ADDITIONAL COMMENTS:					
335-5000-000		.					
APPLICATION WHERE USED	MATERIAL: NONE				SIZE B	PART NUMBER: 300-5061-000	REV B
	FINISH: NONE				SCALE: 1 : 1	DO NOT SCALE THIS DRAWING	SHEET 1 OF 1

REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
1	INITIAL WORKING DRAWING	06/11/02	J.M.M.	



	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON DECIMALS FRAC ANGLES .XX ± .010 ± ~ ± 30' .XXX ± .005 ± ~ ± 30'	DRAWN	J.MESSINA	06/11/02	UNION BIOMETRICA INC. SOMERVILLE, MA. (617) 547-7703			
		ENGINEER	KASSEY	06/11/002				
		APPROVED	.		TITLE: WASTE PUMP ASSEMBLY			
		PROJECT ENGR	A.NAME	QUALITY ASSUR			A.NAME	
		CONCENTRICITY .005 TIR REMOVE BURRS & SHARP EDGES ALL FINISH SURFACES TO BE 32 MICRO INCHES UNLESS NOTED.						
	ADDITIONAL COMMENTS: X							
	MATERIAL					SIZE	PART NUMBER:	REV
TOP LEVEL	NONE					C	300-5065-000	1
APPLICATION WHERE USED	FINISH NONE					SCALE: NONE DO NOT SCALE THIS DRAWING SHEET 1 OF 1		

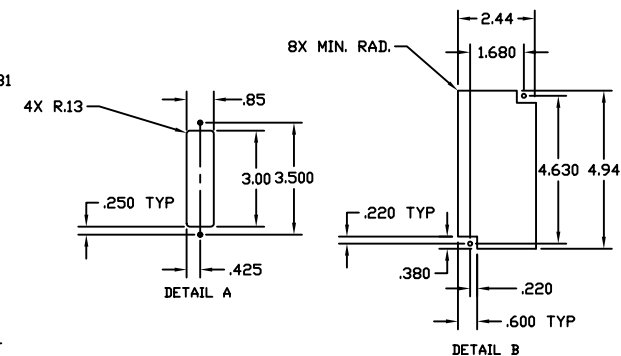
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REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
1	INITIAL WORKING DRAWING	09/12/00	T.F.M.	XXX
2	UPDATE PER MARK UP	11/14/00	P.P.L.	
3	UPDATE PER MARK UP	02/08/01	M.P.G.	
4	REVISED/COMPARED TO ACTUAL	02/12/01	J.M.M.	
5	ADD HINGE DIMS	03/06/01	J.M.M.	
6	ADD MASK DIM, MOVE BACK COVER HOLES	03/23/01	T.F.M.	
7	ADD DIM. TO DETAILS	04/11/01	J.M.M.	
8	ADD MISSING DIMS	04/19/01	J.M.M.	
9	ADD FAR SIDE TO MASK NOTE	05/14/01	J.M.M.	
10	ADD K HOLES, CHG 5.89 TO 5.96	05/22/01	M.P.G.	
11	REVIEW DRAWING CHANGES	07/10/01	J.M.M.	
12	CHG DIM 2.06 TO 2.44	09/24/01	J.M.M.	
13	ADD 2 ITEM K CALLOUT, REFLEX PANEL	1/15/03	J.M.M.	

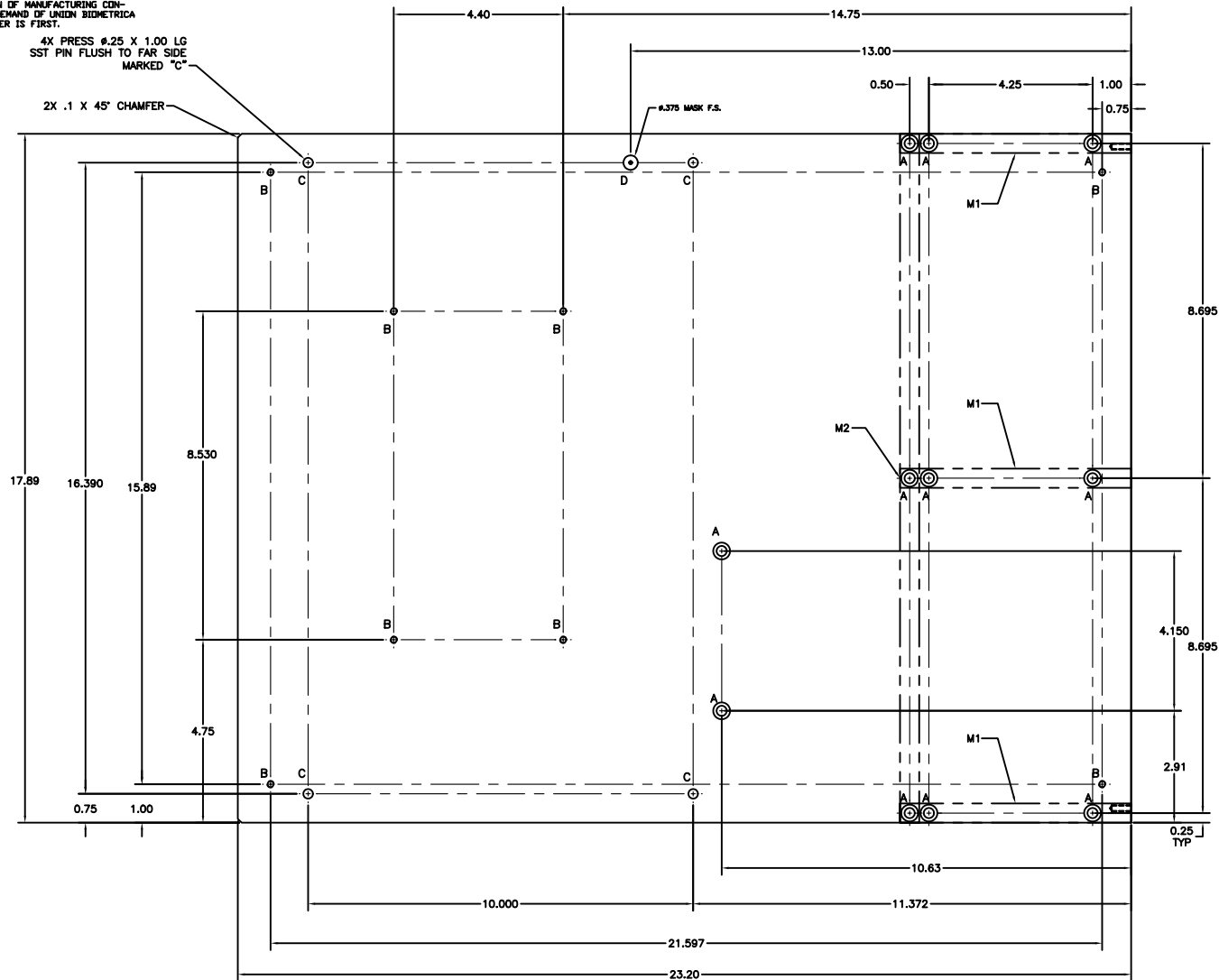
HOLE CHART

- A: 6X ϕ .266 THRU, $\perp \phi$.438 X .260 ∇ N.S.
- B: 8X #8-32 UNC-2B THRU
- C: 8X ϕ .206 THRU, $\perp \phi$.375 X .250 ∇ F.S.
- D: 2X #10-32 UNF-2B THRU
- E: 2X #4-40 UNC-2B THRU
- F: 3X #1/4-20 UNC-2B X .50 ∇ .
- G: 10X ϕ .266 THRU, $\perp \phi$.438 X .260 ∇ F.S.
- H: 1X ϕ .206 THRU, $\perp \phi$.375 X .250 ∇ N.S.
- J: 3X ϕ .201 THRU
- K: 15X #6-32 UNC-2B THRU
- M1: MASK ANODIZE (.5 X 5.5) F.S.
- M2: MASK ANODIZE (.8 X 4.0) F.S.
- M3: MASK ANODIZE (.38 X 9.88) F.S.
- M4: MASK ANODIZE (.5 X 17.89)
- N: 6X ϕ .34 THRU



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		DRAWN	T.F. MULLINS	09/12/00	UNION BIOMETRICA INC.	
TOLERANCE ON		ENGINEER	KASSEY	09/22/00	SOMERVILLE, MA. (617) 547-7703	
DECIMALS		APPROVED			TITLE	
FRACTIONAL		PROJECT	KASSEY	QUALITY	BACK PLATE	
ANGLES		OWNER		ASSUR.	SIZE	
30° ± .01		ADDITIONAL COMMENTS		D		REV
30° ± .05				350-1001-000		13
CONCENTRICITY .005 TIR				SCALE 1 : 1		DO NOT SCALE THIS DRAWING
REMOVE BURRS & SHARP EDGES				SHEET 1 OF 2		
ALL FINISHED SURFACES TO BE						
32 MICROINCHES UNLESS NOTED.						
MATERIAL						
1/2" THK. ALUMINUM						
FINISH						
BLACK ANODIZE						
APPLICATION WHERE USED						

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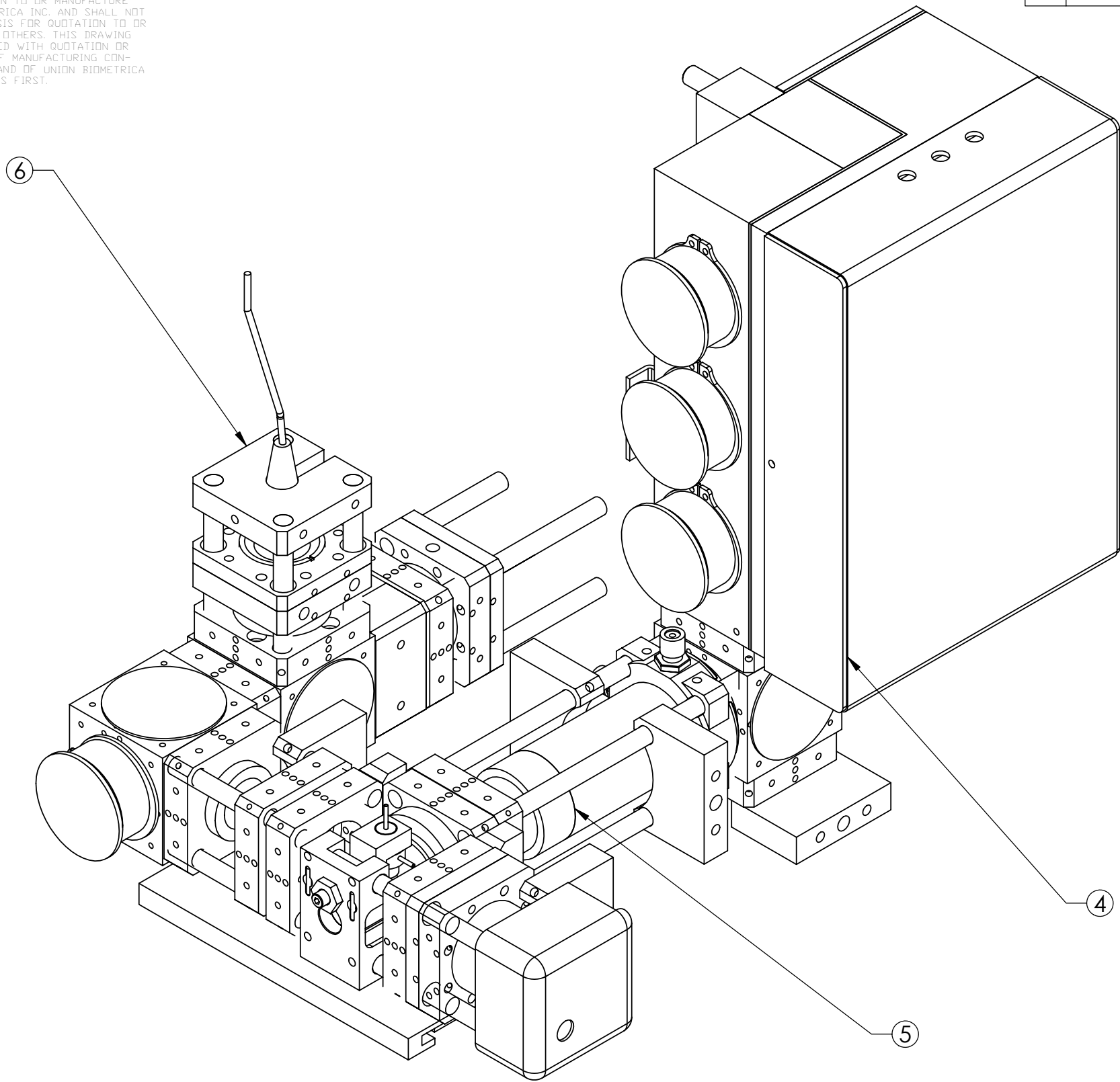
REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
1	INITIAL WORKING DRAWING	12/20/00	T.F.M.	XXX
2	MOVE STAGE HOLES 1.50	12/20/01	T.F.M.	-
3	ADD HOLES FOR BACK COVER	02/02/01	M.P.G.	-
4	REVISED/COMPARED TO ACTUAL	02/13/01	J.M.M.	-
5	UPDATE PER MARK-UP (G.M.)	03/01/01	M.P.G.	-
6	CHG SUPPORT HOLE PATTERN TO 3.15	03/06/01	J.M.M.	-
7	ADD DIM FOR MASKING	03/23/01	T.F.M.	-
8	ADD SST PIN NOTE	03/28/01	J.M.M.	-
9	ADD FAR SIDE NOTE TO MASKING	05/14/01	J.M.M.	-
10	REVIEW DRAWING CHANGES	07/10/01	J.M.M.	-
.

A: 11X ϕ .266 THRU CBORE ϕ .438 X .260 DP
B: 8X #10-32-UNF-2B THRU
C: 4X ϕ .249 THRU
D: 1X #6-32-UNC THRU
E: 2X #8-32-UNC X .50 DP (BOTTOM TAP)
M1: MASK ANODIZE (.5 X 6.0) FAR SIDE
M2: MASK ANODIZE (.5 X 17.89) FAR SIDE
M3: MASK ANODIZE ON SURFACE INDICATED

	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES			DRAWN	T.F.MULLINS	12/20/00	UNION BIOMETRICA INC. SOMERVILLE, MA. (617) 547-7703		
	TOLERANCE ON DECIMALS FRAC ANGLES			ENGINEER	KASSEY	12/20/00			
	.005 ± .010 CONCENTRICITY .005 TIR REMOVE BURRS & SHARP EDGES ALL FINISHED SURFACES TO BE .32 MICROINCHES UNLESS NOTED.			APPROVED	-	-			
				PROJECT ENGR	KASSEY	QUALITY ASSUR			
				ADDITIONAL COMMENTS: X			TITLE		
MATERIAL 1/2" THK. ALUMINUM									
ALL	FINISH BLACK ANODIZE						SIZE D	350-1/2-000	REV 10
APPLICATION WHERE USED							SCALE 1 : 2 DO NOT SCALE THIS DRAWING SHEET 1 OF 1		

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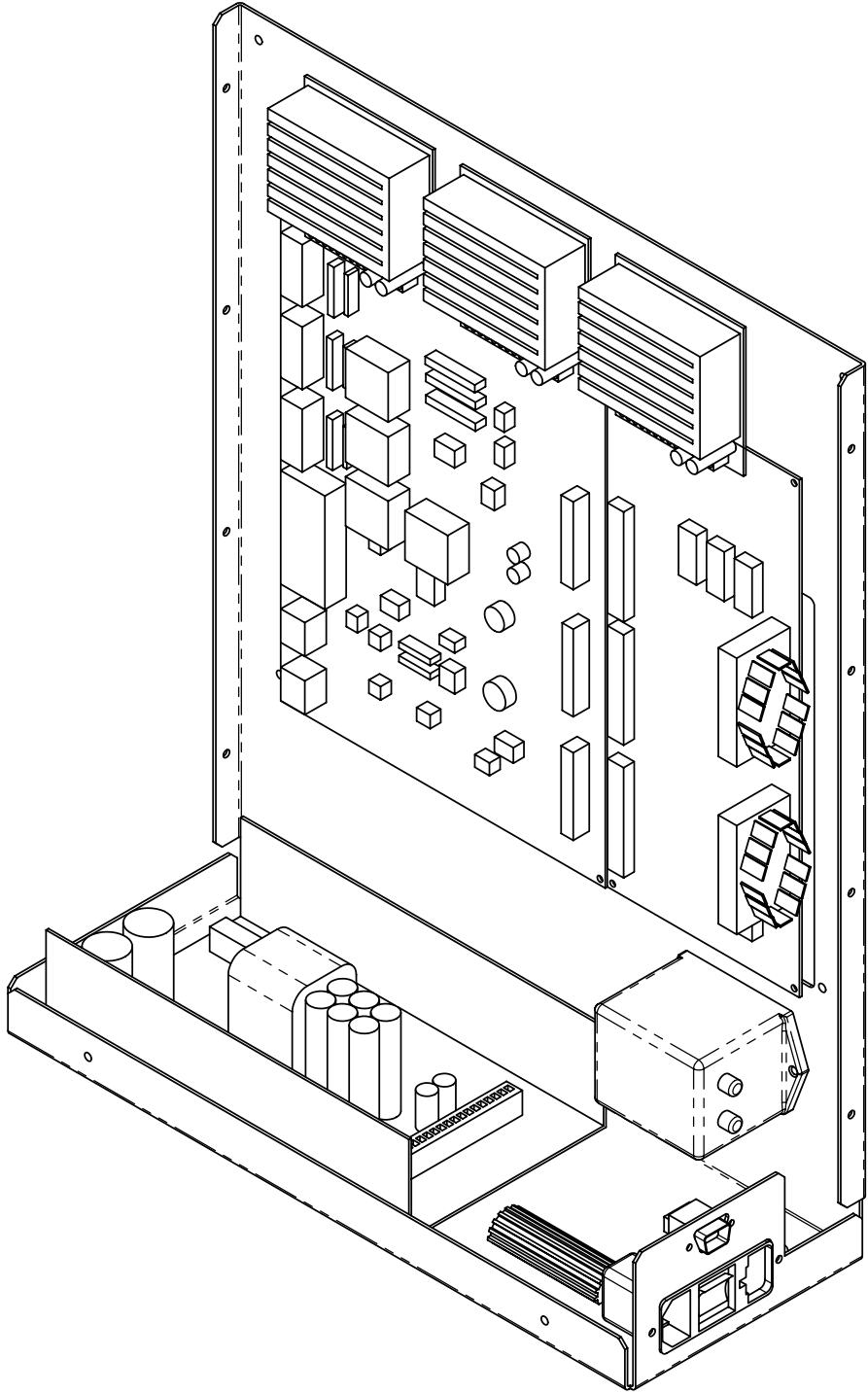
REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
1	INITIAL WORKING DRAWING	06/26/01	J.M.M.	



ITEM NO.	QTY.	PART NO.	DESCRIPTION
4	1	350-5014-000	
5	1	350-5006-000	
6	1	350-5005-000	

	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES			DRAWN	J.MESSINA	06/26/01	UNION BIOMETRICA INC. SOMERVILLE, MA. (617) 547-7703		
	TOLERANCE ON			ENGINEER	KASSEY	06/26/01	ASSEMBLY, FINAL OPTICS		
	DECIMALS	FRAC	ANGLES	APPROVED					
	.XX ± .010		± ~ ± 30°	PROJECT ENGR		QUALITY ASSUR			
	.XXX ± .005			ADDITIONAL COMMENTS: X					
370-5000-000	CONCENTRICITY .005 TIR REMOVE BURRS & SHARP EDGES ALL FINISH SURFACES TO BE 32 MICRO INCHES UNLESS NOTED.								
360-5000-000									
350-5000-000	MATERIAL			NONE					
335-5000-000	FINISH			NONE					
APPLICATION WHERE USED							SIZE	350-5020-000	REV 1
SCALE 1 : 1			DO NOT SCALE THIS DRAWING			SHEET 1 OF 1			

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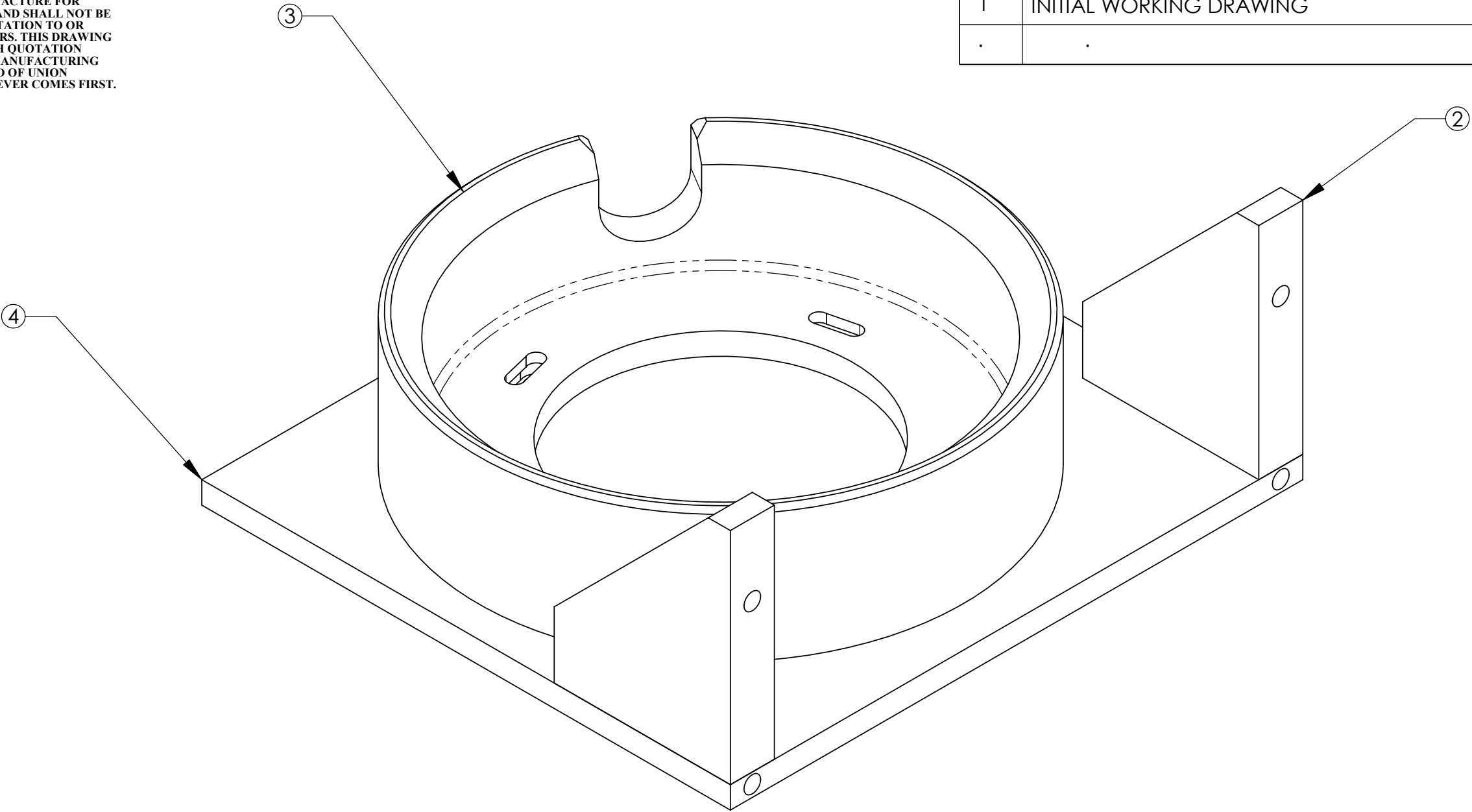


REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
1	INITIAL WORKING DRAWING	04/22/03	J.M.M.	.

	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON DECIMALS FRAC ANGLES .XX ± .010 ± ~ ± 30' .XXX ± .005 ± ~ ± 30'	DRAWN	J.MESSINA	04/21/03	UNION BIOMETRICA INC. SOMERVILLE, MA. (617) 591-1211							
		ENGINEER	.	.								
		APPROVED	.	.	TITLE: ASSEMBLY, SYSTEM ELECTRONICS PANEL							
		PROJECT ENGR	.	QUALITY ASSUR				.				
	ADDITIONAL COMMENTS: X			SIZE C				PART NUMBER: 350-5027-000		REV 1		
	CONCENTRICITY .005 TIR REMOVE BURRS & SHARP EDGES ALL FINISH SURFACES TO BE 32 MICRO INCHES UNLESS NOTED.							SCALE: 1 : 2			DO NOT SCALE THIS DRAWING	
	MATERIAL NONE											
350-5000-000	FINISH NONE											
APPLICATION WHERE USED												

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REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
1	INITIAL WORKING DRAWING	07/24/02	J.M.M.	.
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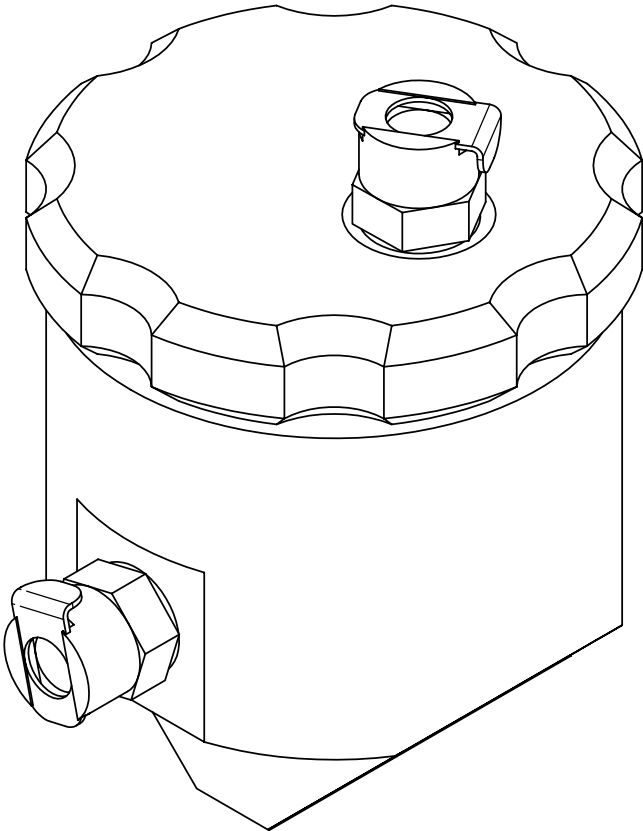


ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	300-1042-000	RING, SAMPLE BOTTLE SUPPORT
2	1	350-1003-000	PLATE, SAMPLE BOTTLE
3	2	300-1044-000	BRACKET, SUPPORT

	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCE ON DECIMALS FRAC ANGLES ± .XX ± .010 ± ~ 30' ± .XXX ± .005	DRAWN	J.MESSINA	07/24/02	UNION BIOMETRICA INC. SOMERVILLE, MA. (617) 547-7703			
		ENGINEER	KASSEY	07/24/02				
		APPROVED	.		.	TITLE: SUPPORT ASSEMBLY, SAMPLE BOTTLE		
		PROJ. ENG.	.	QUALITY ASSUR.	.			
360-5000-000	CONCENTRICITY .005 TIR. REMOVE BURRS & SHARP EDGES. ALL FINISH SURFACES TO BE 32 MICROINCHES UNLESS NOTED.	ADDITIONAL COMMENTS:			SIZE B	PART NUMBER: 350-5041-000		REV 1
350-5000-000		.						
APPLICATION WHERE USED	MATERIAL: NONE				SCALE: NONE		DO NOT SCALE THIS DRAWING	SHEET 1 OF 1
	FINISH: NONE							

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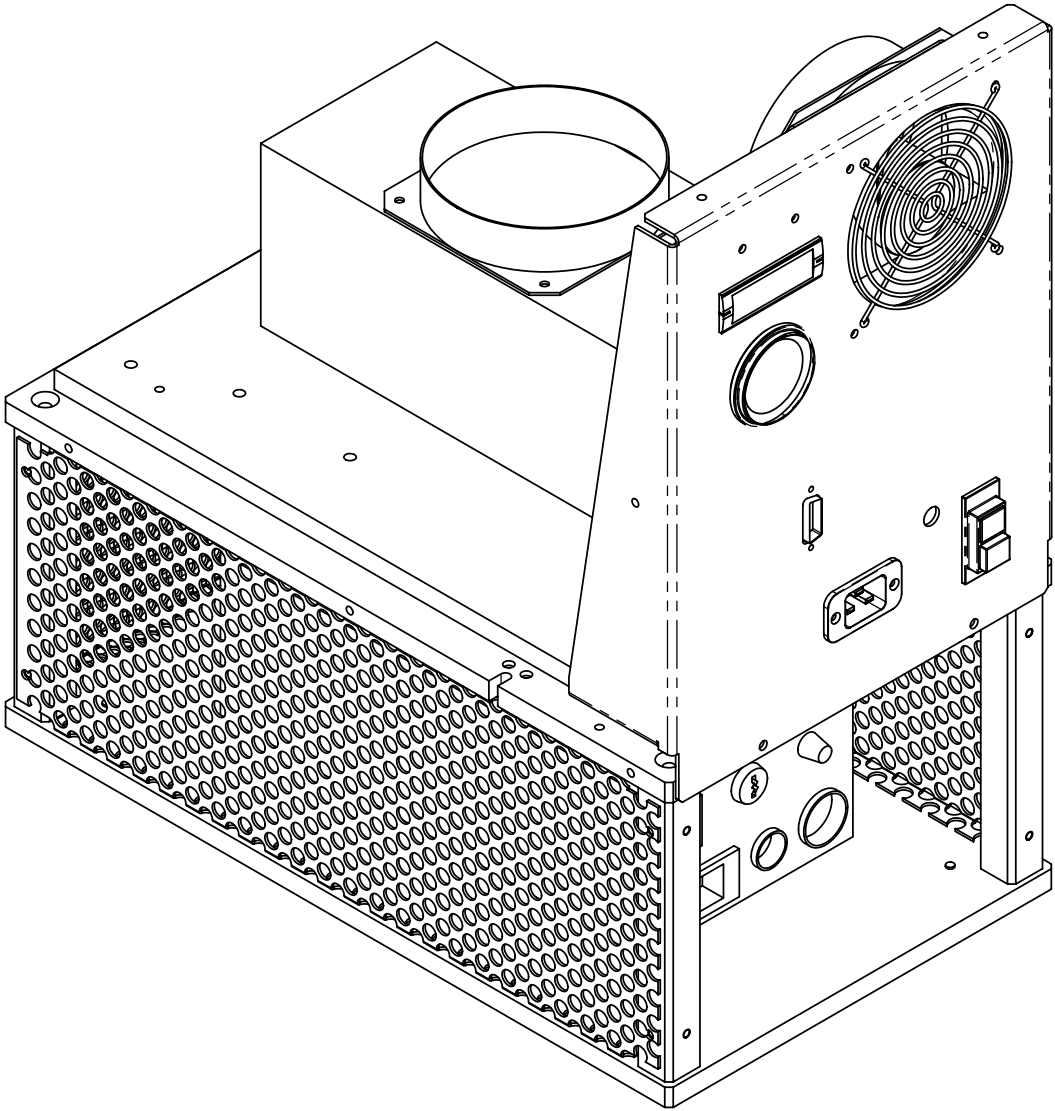
REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
1	INITIAL WORKING DRAWING	07/15/02	J.M.M.	.
.



	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCE ON DECIMALS FRAC ANGLES ± .XX ± .010 ± ~ 30' ± .XXX ± .005	DRAWN	J.MESSINA	07/15/02	UNION BIOMETRICA INC. SOMERVILLE, MA. (617) 591-1211				
		ENGINEER	KASSEY	07/15/02					
		APPROVED	.		.	TITLE: ASSEMBLY, SAMPLE CUP			
		PROJ. ENG.	.	QUALITY ASSUR.	.				
	CONCENTRICITY .005 TIR. REMOVE BURRS & SHARP EDGES. ALL FINISH SURFACES TO BE 32 MICROINCHES UNLESS NOTED.	ADDITIONAL COMMENTS: .				SIZE B PART NUMBER: 350-5039-000 REV 1			
350—5000—000	MATERIAL: NONE								
APPLICATION WHERE USED	FINISH: NONE					SCALE: 1 : 2		DO NOT SCALE THIS DRAWING	SHEET 1 OF 1

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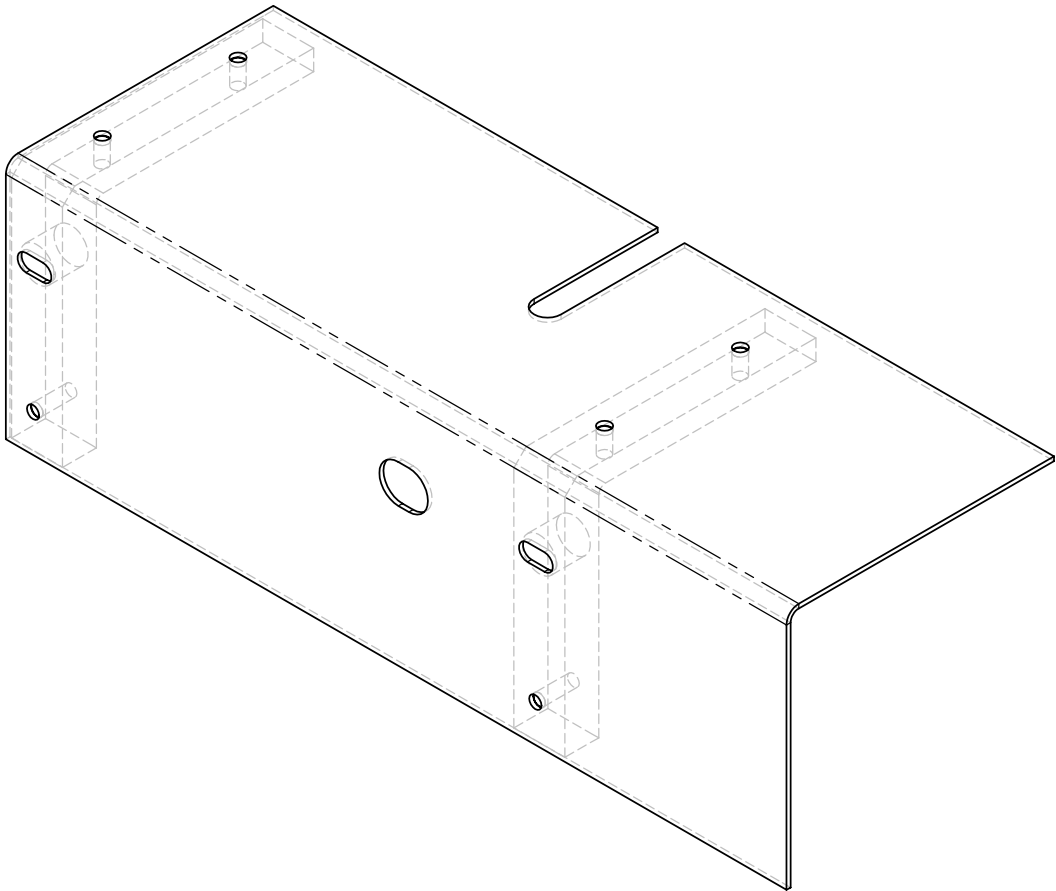
REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
1	INITIAL WORKING DRAWING	04/22/02	J.M.M.	.



	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON	DRAWN	J.MESSINA	04/22/02	UNION BIOMETRICA INC. SOMERVILLE, MA. (617) 591-1211	
	DECIMALS FRAC ANGLES .XX ± .010 ± ~ ± 30' .XXX ± .005	ENGINEER	KASSEY	04/22/02		
	CONCENTRICITY .005 TIR REMOVE BURRS & SHARP EDGES ALL FINISH SURFACES TO BE 32 MICRO INCHES UNLESS NOTED.	APPROVED	.	.	TITLE: ASSEMBLY, ARGON LASER SYSTEM	
		PROJECT ENGR	.	QUALITY ASSUR		
	MATERIAL	ADDITIONAL COMMENTS: X			SIZE	REV
ALL	FINISH				C	1
APPLICATION WHERE USED	NONE				PART NUMBER: 350-5021-000	
		SCALE: 1 : 3	DO NOT SCALE THIS DRAWING		SHEET 1 OF 1	

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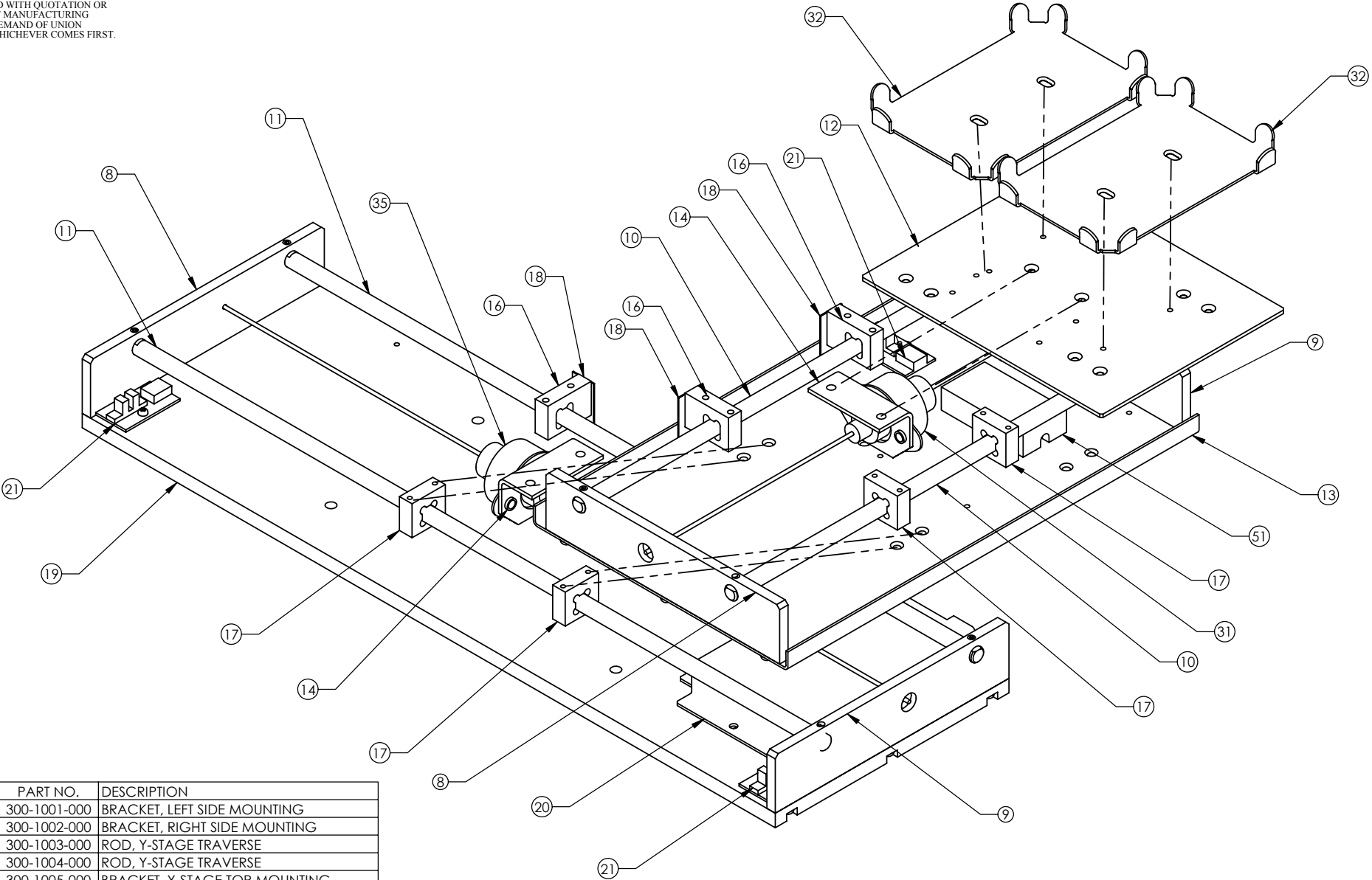
REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
1	INITIAL WORKING DRAWING	02/05/03	J.M.M.	.
.



	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCE ON DECIMALS FRAC ANGLES ± .XX ± .010 ± ~ 30' ± .XXX ± .005	DRAWN	J.MESSINA	02/05/03	UNION BIOMETRICA INC. SOMERVILLE, MA. (617) 591-1211				
		ENGINEER	.	.					
			APPROVED	.	.	TITLE: ASSEMBLY, LASER COVER			
	CONCENTRICITY .005 TIR. REMOVE BURRS & SHARP EDGES. ALL FINISH SURFACES TO BE 32 MICROINCHES UNLESS NOTED.	PROJ. ENG.	.	QUALITY ASSUR.	.				
		ADDITIONAL COMMENTS: .							
350—5000—000	MATERIAL: NONE				SIZE B	PART NUMBER: 350-5023-000			REV 1
APPLICATION WHERE USED	FINISH: NONE				SCALE: 1 : 2		DO NOT SCALE THIS DRAWING	SHEET 1 OF 1	

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REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
C	INITIAL WORKING DRAWING	06/03/02		

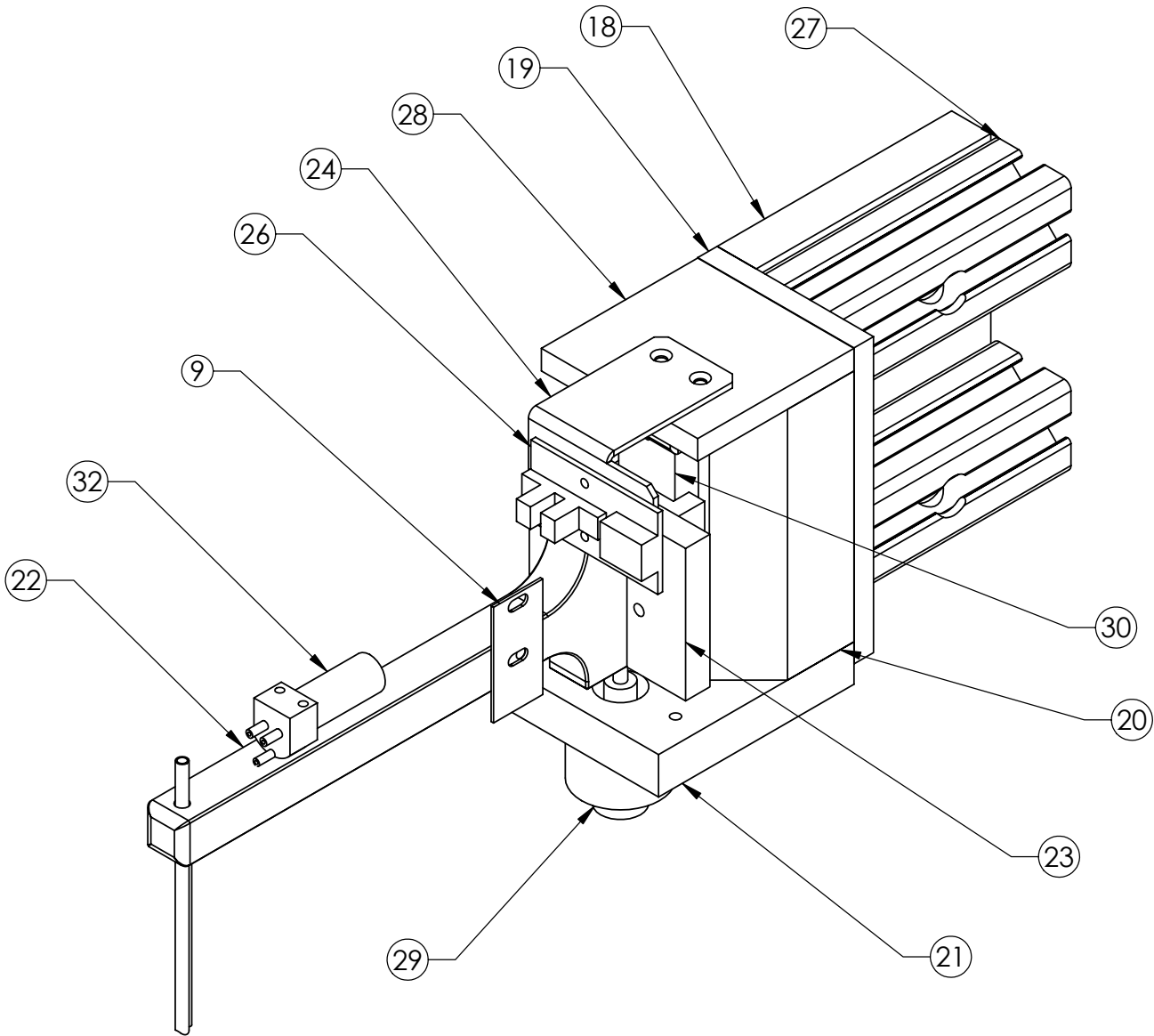


ITEM NO.	QTY.	PART NO.	DESCRIPTION
8	2	300-1001-000	BRACKET, LEFT SIDE MOUNTING
9	2	300-1002-000	BRACKET, RIGHT SIDE MOUNTING
10	2	300-1003-000	ROD, Y-STAGE TRAVERSE
11	2	300-1004-000	ROD, Y-STAGE TRAVERSE
12	1	300-1005-000	BRACKET, Y-STAGE TOP MOUNTING
13	1	300-1006-000	BRACKET, X-STAGE TOP MOUNTING
14	2	300-1009-000	BRACKET, MOTOR MOUNTING
16	4	300-1011-000	BEARING, LARGE MOTOR MOUNTING
17	4	300-1012-000	BEARING, SMALL MOTOR MOUNTING
18	4	300-1013-000	VANE, HALL-EFFECT
19	1	300-1014-000	BASEPLATE, X-STAGE
20	1	300-1046-000	COVER, X-STAGE CONNECTOR
32	2	300-1100-000	PLATE, LOCATOR
51	1	300-1103-000	COVER, PCB, X-Y STAGE
21	4	300-5011-000	ASSEMBLY, PCB, LIMIT SENSOR
31	1	300-5024-000	ASSEMBLY, MOTOR, Y-STAGE
35	1	300-5025-000	ASSEMBLY, MOTOR, X-STAGE

	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON DECIMALS FRAC ANGLES .XX ± .010 ± ~ ± 30' .XXX ± .005	DRAWN	J.MESSINA	06/03/02	UNION BIOMETRICA INC. SOMERVILLE, MA. (617) 547-7703				
		ENGINEER	KASSEY	06/03/02					
		APPROVED	.		.	TITLE: X-Y STAGE ASSEMBLY			
		PROJECT ENGR	QUALITY ASSUR						
	CONCENTRICITY .005 TIR REMOVE BURRS & SHARP EDGES ALL FINISH SURFACES TO BE 32 MICRO INCHES UNLESS NOTED.	ADDITIONAL COMMENTS: X			SIZE		PART NUMBER: 300-5018-000	REV C	
	MATERIAL	NONE							
TOP LEVEL									
APPLICATION WHERE USED	FINISH	NONE			SCALE: NONE			DO NOT SCALE THIS DRAWING	SHEET 1 OF 1

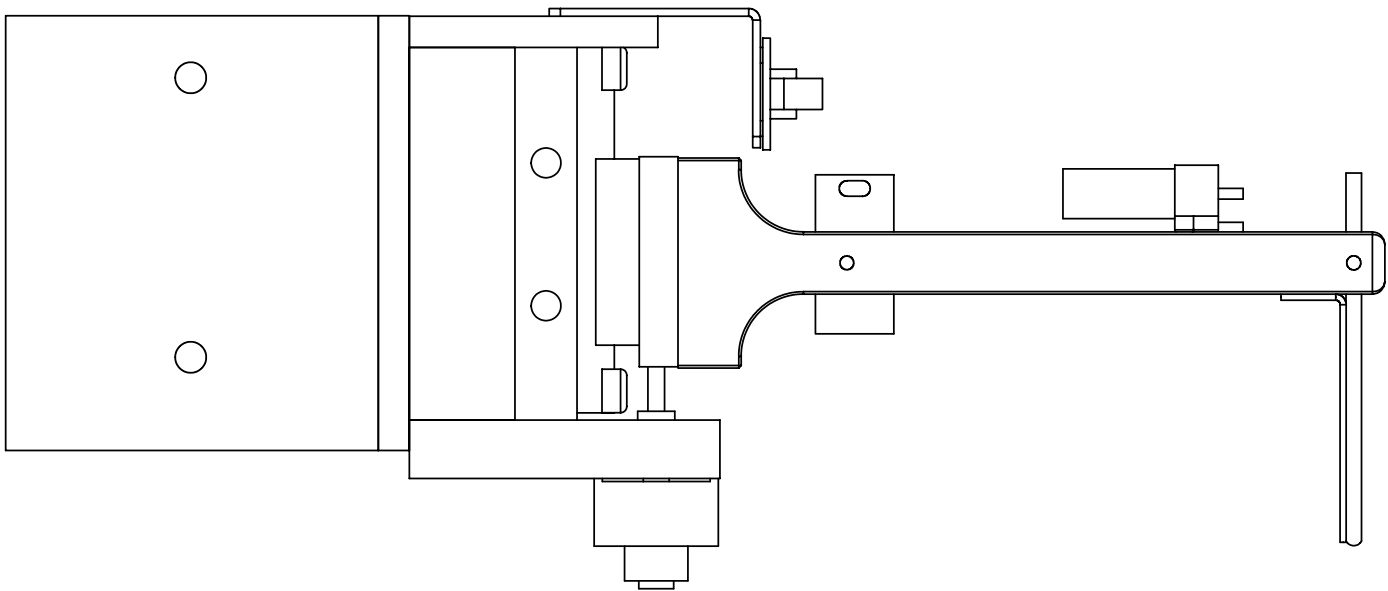
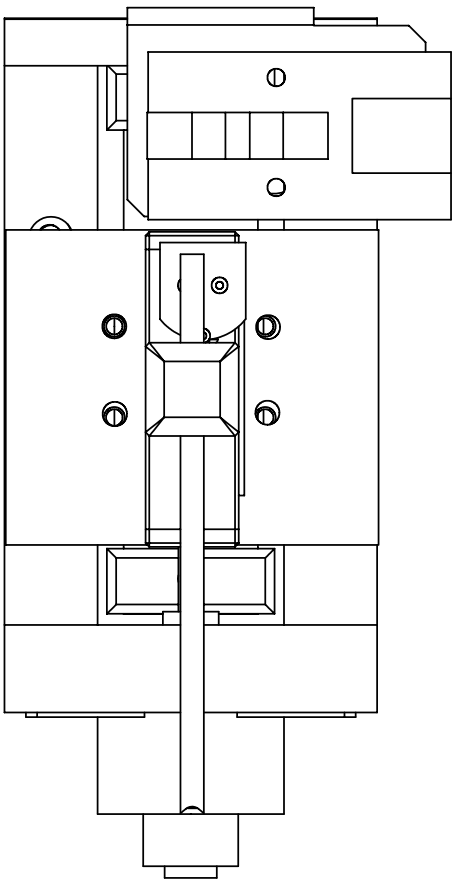
THIS DRAWING IS THE SOLE PROPERTY OF UNION BIOMETRICA INC. AND SHALL NOT BE REPRODUCED IN ANY FORM WHATSOEVER. THE CONTENTS ARE FOR THE PURPOSES ONLY OF QUOTATION TO OR MANUFACTURE FOR UNION BIOMETRICA INC. AND SHALL NOT BE USED AS A BASIS FOR QUOTATION TO OR MANUFACTURE FOR OTHERS. THIS DRAWING SHALL BE RETURNED WITH QUOTATION OR AT TERMINATION OF MANUFACTURING CONTRACT OR ON DEMAND OF UNION BIOMETRICA INC., WHICHEVER IS FIRST.

REV	REVISIONS & DESCRIPTION	DATE	MADE BY	APPROVED
1	INITIAL WORKING DRAWING	11/30/01	J.M.M.	



ITEM NO.	QTY.	PART NO.
9	1	300-1013-000
18	1	340-1006-000
19	1	340-1001-000
20	1	340-1002-000
21	1	340-1004-000
22	1	340-1007-000
23	1	340-1003-000
24	1	340-1012-000
26	1	300-5011-000
27	2	340-1010-000
28	1	340-1005-000
29	1	070-0040-002
30	1	199-0006-002
31	1	199-0006-001
32	1	120-0003-003
33	1	340-1008-000

	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	DRAWN	J.MESSINA	11/30/01	UNION BIOMETRICA INC. SOMERVILLE, MA. (617) 547-7703		
	TOLERANCE ON DECIMALS FRAC ANGLES	ENGINEER	KASSEY	11/30/01	SAMPLER, ASSEMBLY		
	.XX ± .010 ± ~ ± 30'	APPROVED					
	.XXX ± .005	PROJECT ENGR	QUALITY ASSUR	A.NAME			
	CONCENTRICITY .005 TIR REMOVE BURRS & SHARP EDGES ALL FINISH SURFACES TO BE 32 MICRO INCHES UNLESS NOTED.	ADDITIONAL COMMENTS: X			SIZE C 340-5000-000 REV 1		
	MATERIAL	NONE					
340-5000-000	FINISH	NONE			SCALE 1 : 2 DO NOT SCALE THIS DRAWING SHEET 1 OF 1		
APPLICATION WHERE USED							



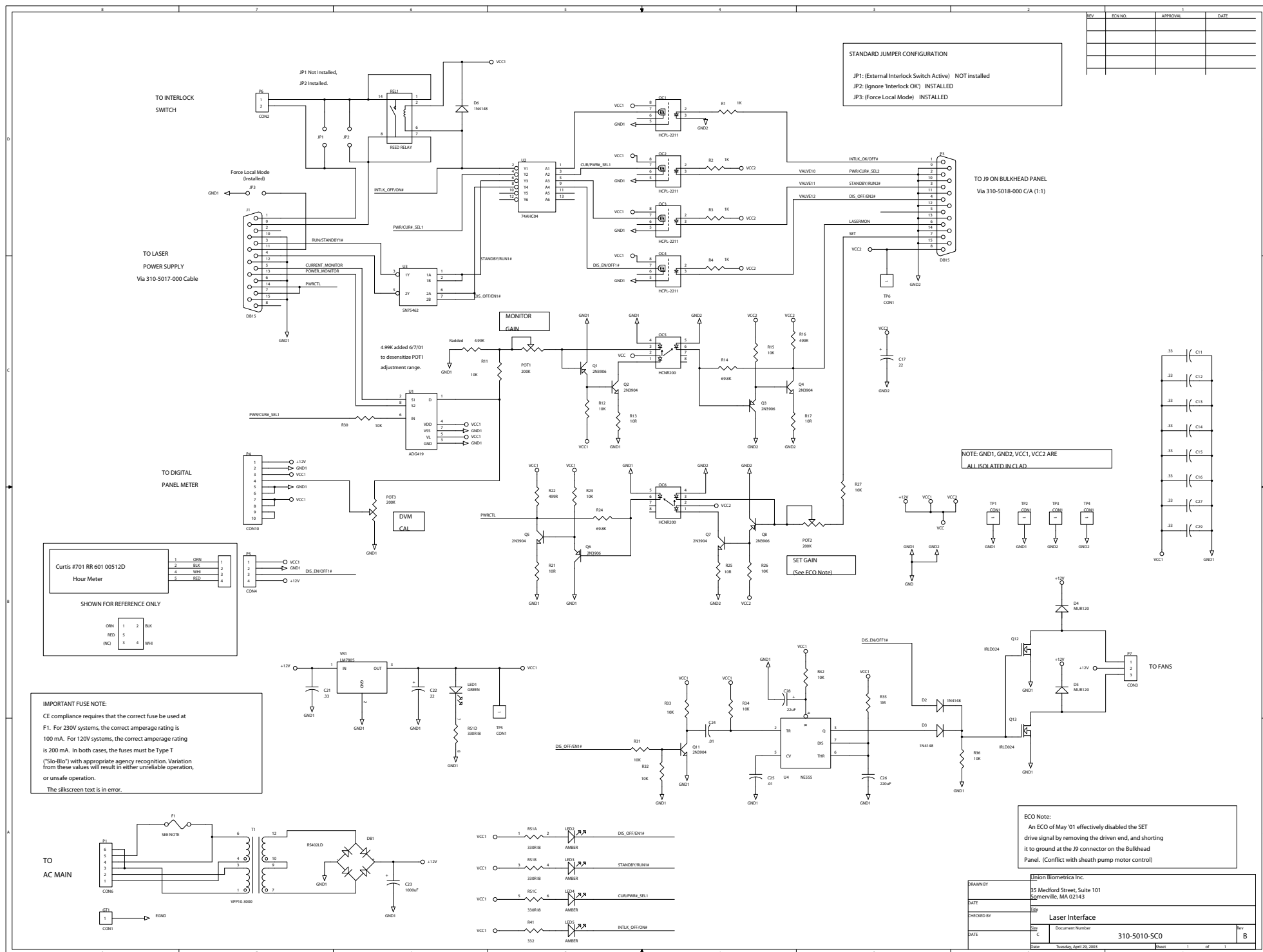
Printed Circuit Boards

Assembly #	Description	Board Revision No.	Parts List Revision No.	Notes
310-5010-000	Laser Interface	Rev B	Rev C2	
340-5005-000	ReFlx Sampler	Rev B	Rev 4	ReFlx option
350-5001-000	Sorter Controller	Rev D	Rev D1	
350-5002-000	Bulkhead Connector	Rev A	Rev A3	
350-5008-000	Extinction Detector	Rev A	Rev A3	
350-5009-000	PMT Preamp/HV	Rev A	Rev A1	

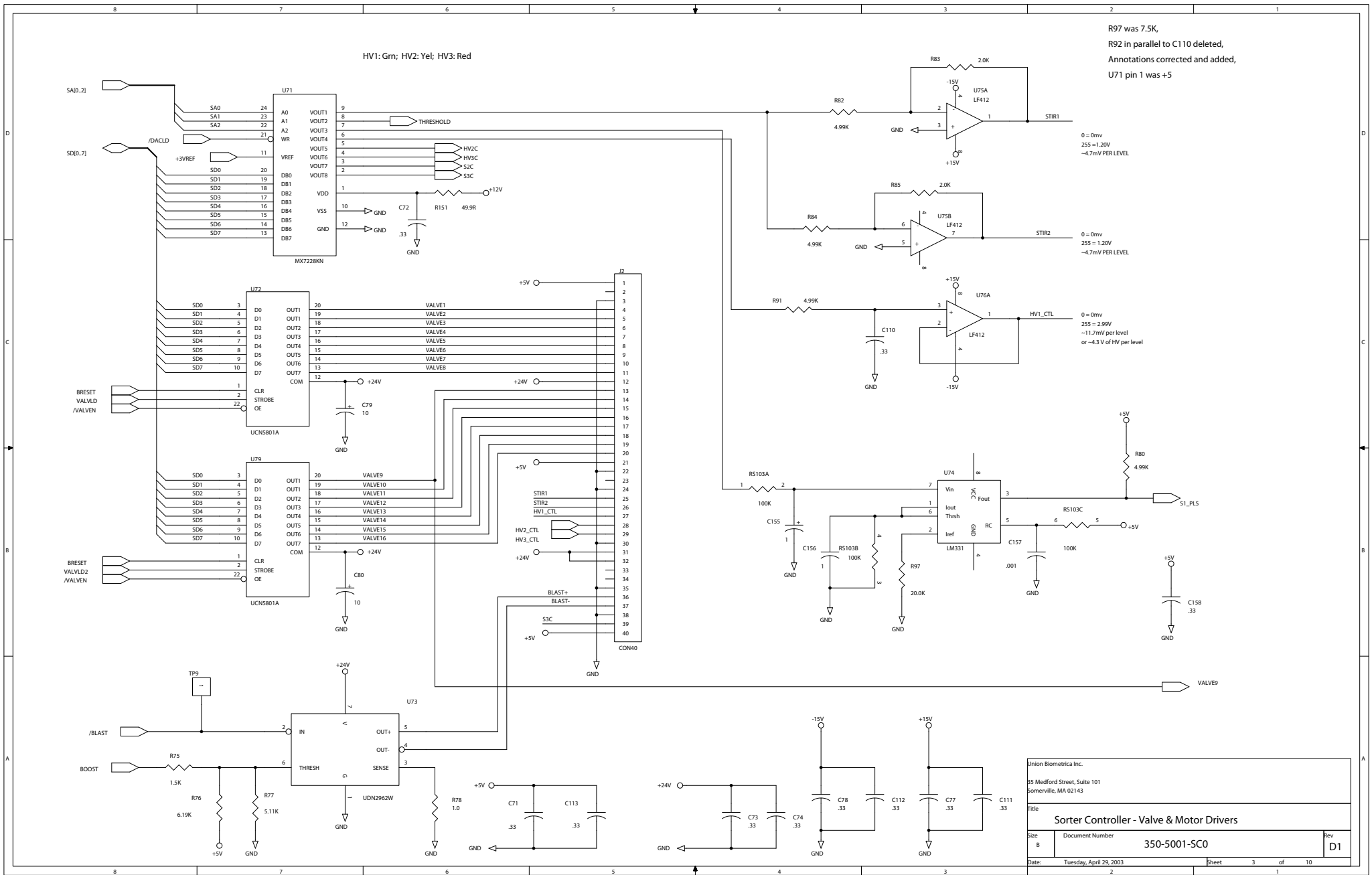
Drawings matching these part numbers / descriptions immediately following this page.

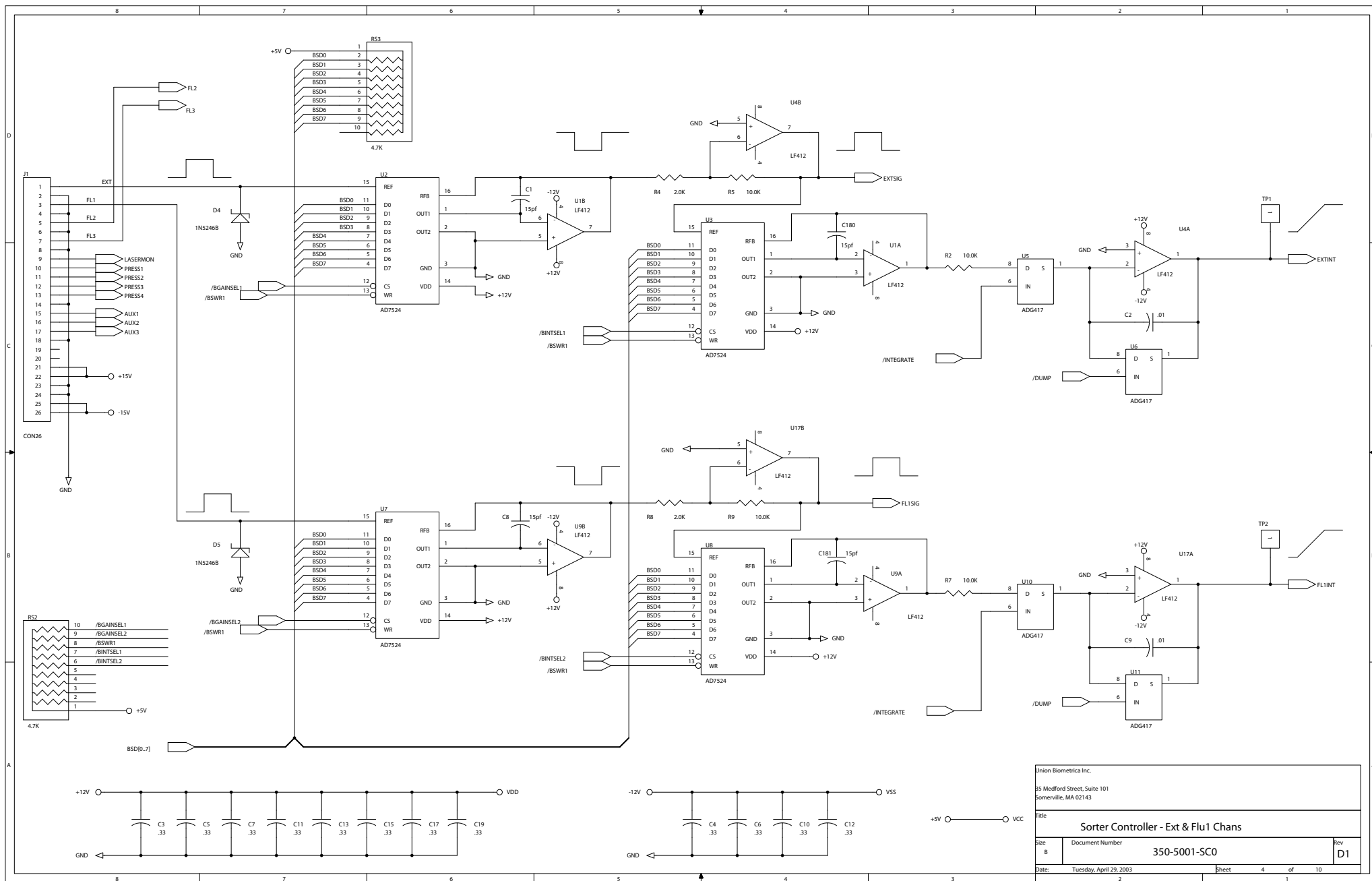
Major Cable Assemblies

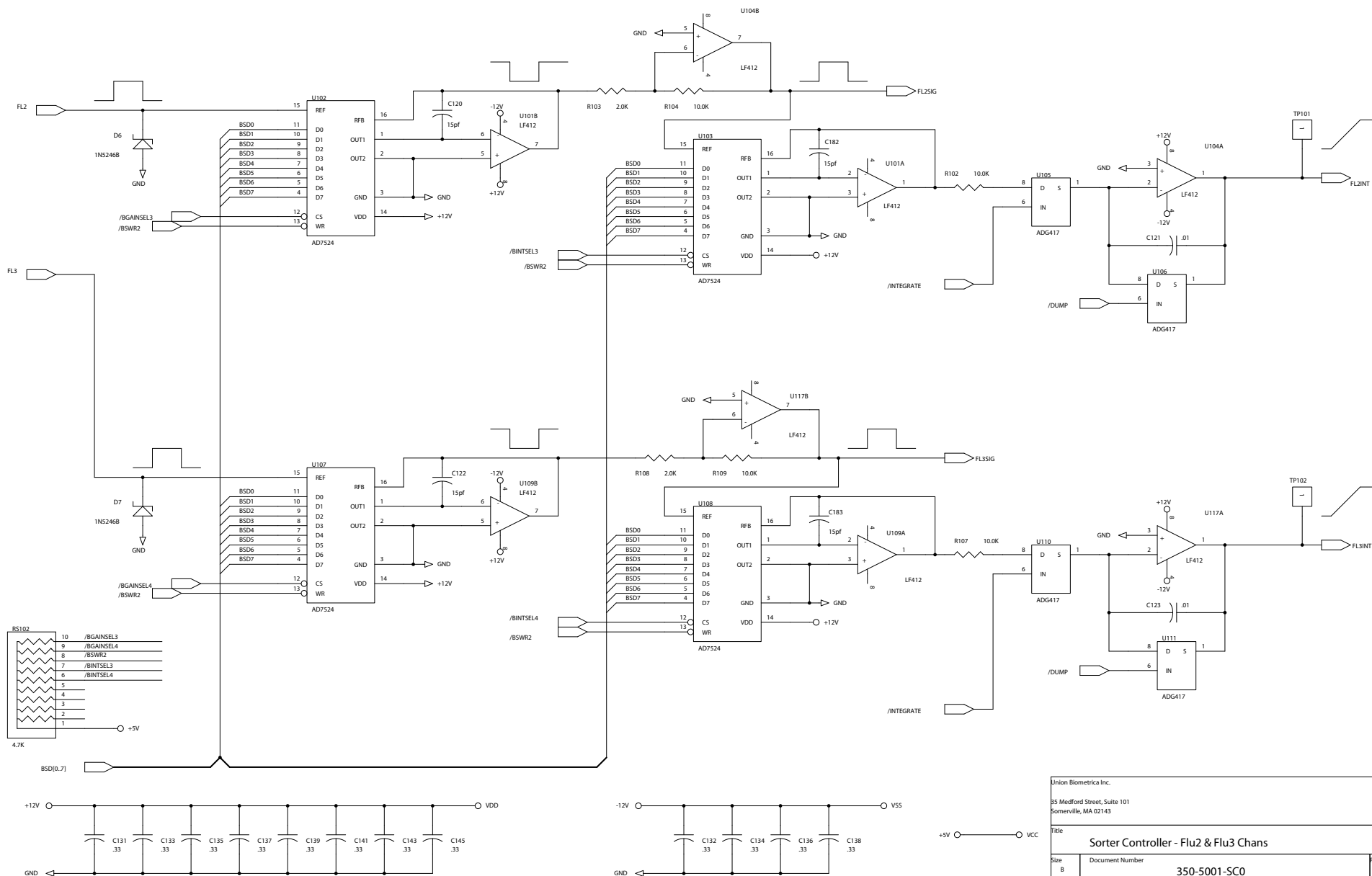
Assembly #	Description	Board Revision No.	Parts List Revision No.	Notes
300-5019-000	XY Internal C/A	Rev A	Rev A	
300-5048-000	Stage C/A	Rev A	Rev A	
300-5055-000	Valve Panel C/A	Rev A	Rev A	
310-5018-000	Laser Control	Rev A	Rev A	
335-5064-000	Blaster C/A	Rev A	Rev A	
340-5006-000	Frontside C/A	Rev 5	Rev 5	ReFlx option
340-5007-000	Backside C/A	Rev 7	Rev 5	ReFlx option
350-5010-000	PMT C/A	Rev 1	Rev 1	
350-5011-000	Detector C/A	Rev 2	Rev 2	
350-5012-000	Stirrer C/A	Rev 2	Rev 2	
350-5013-000	Sheath C/A	Rev 2	Rev 2	



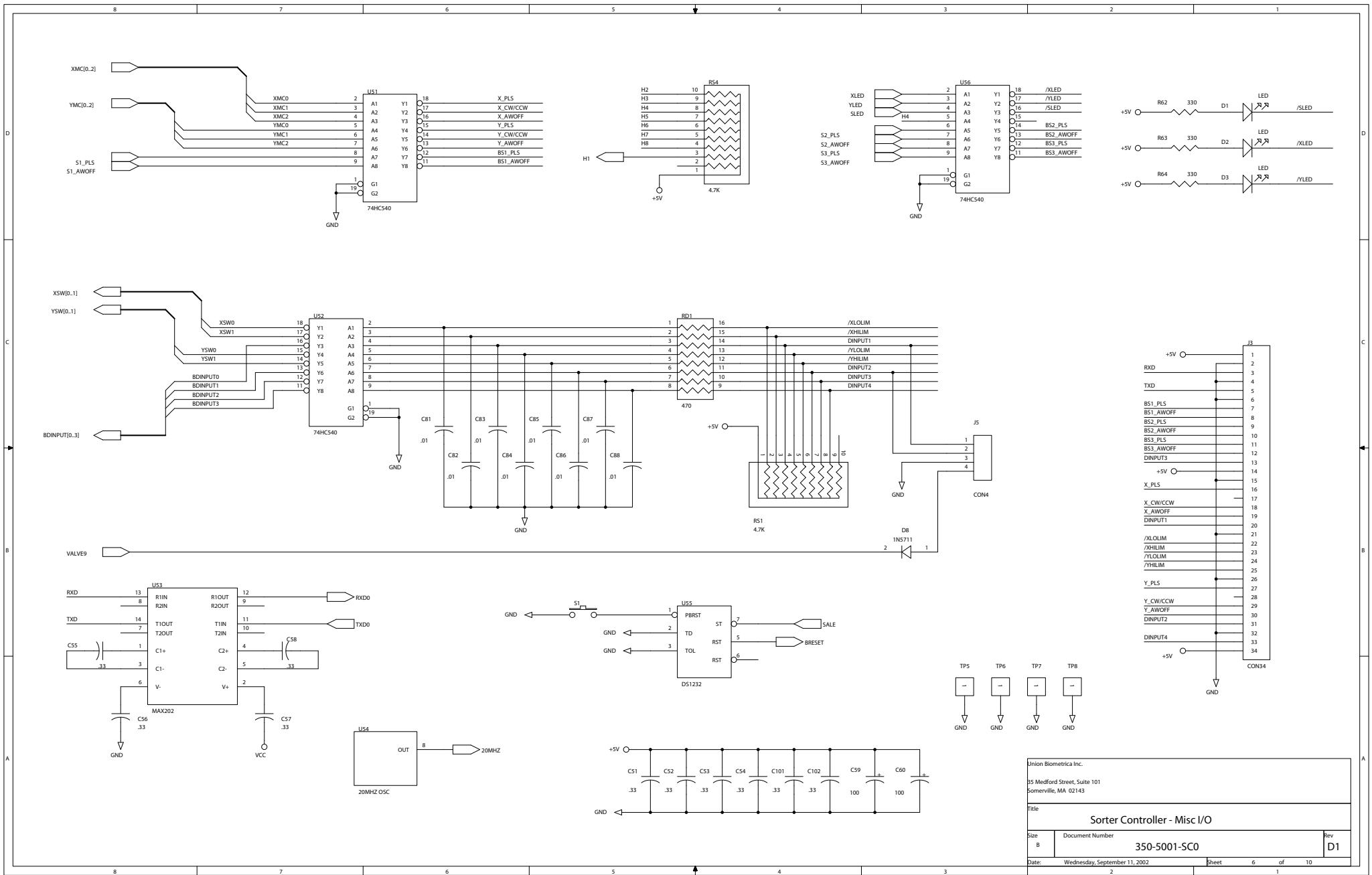


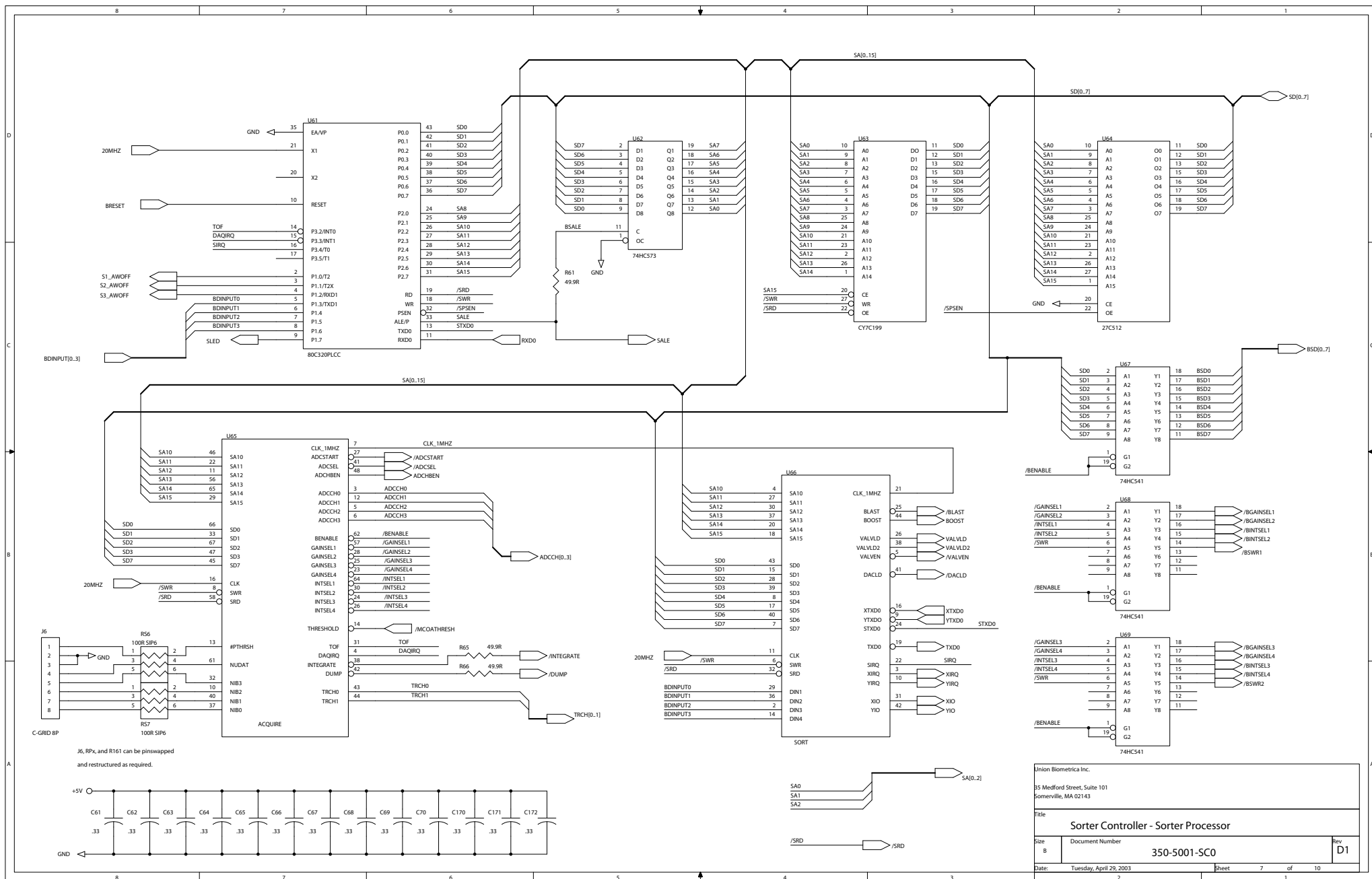


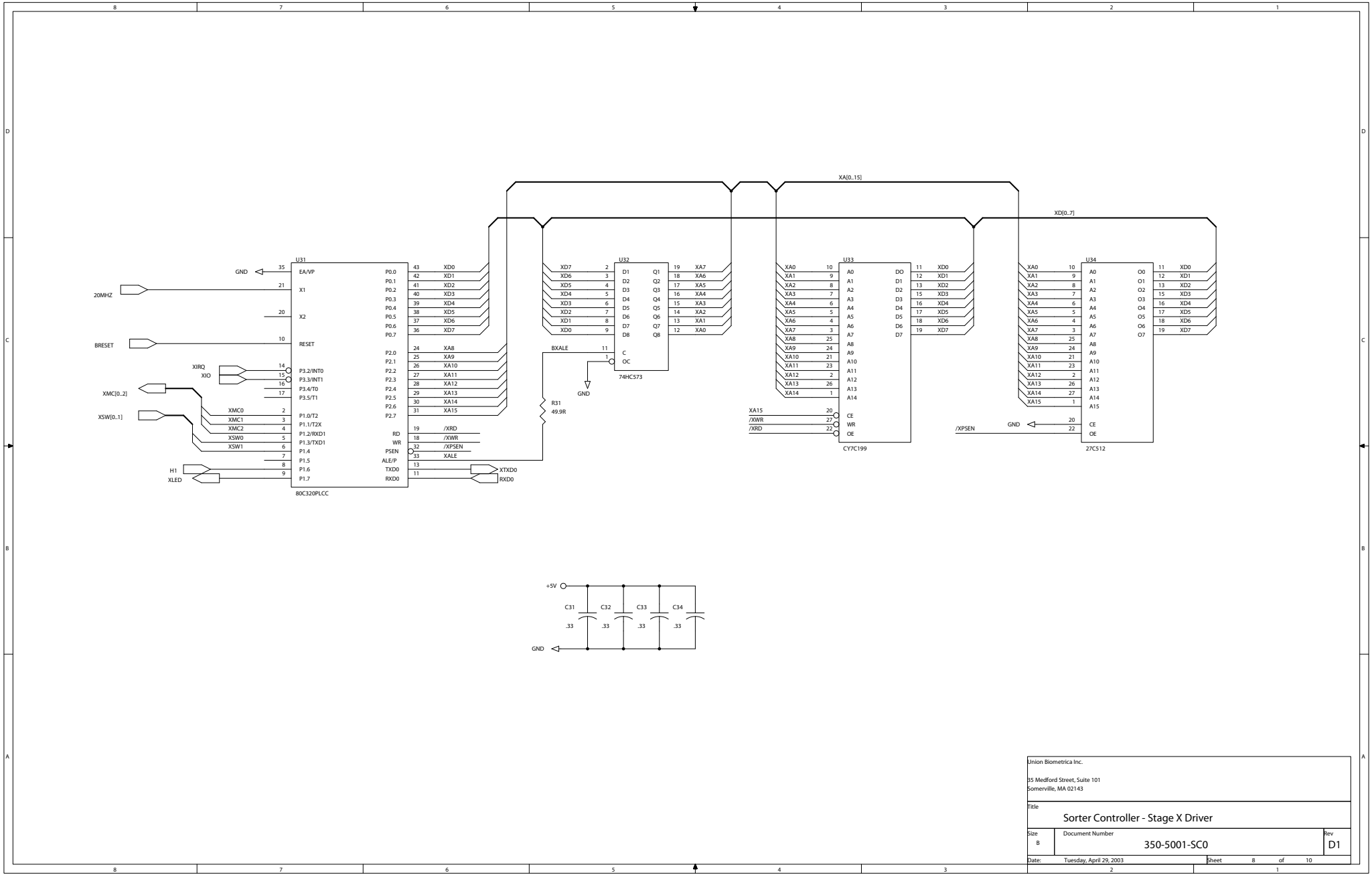




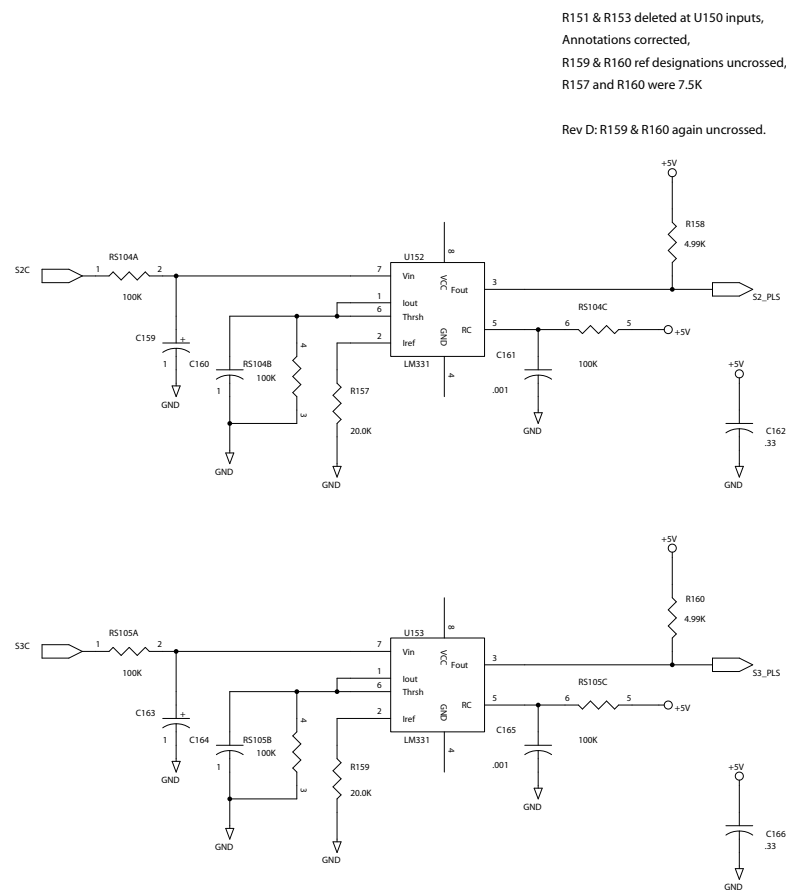
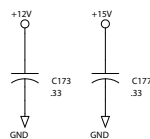
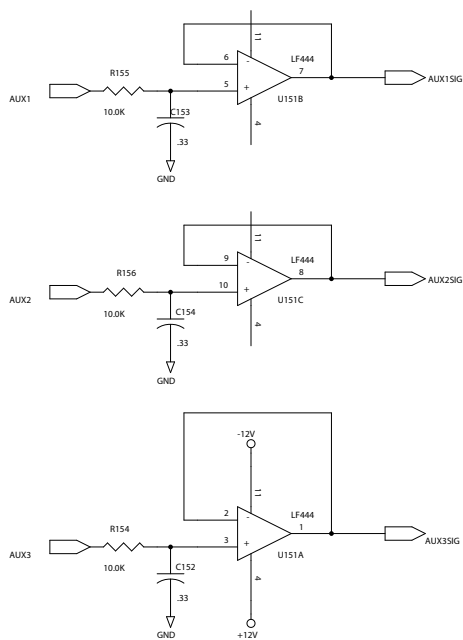
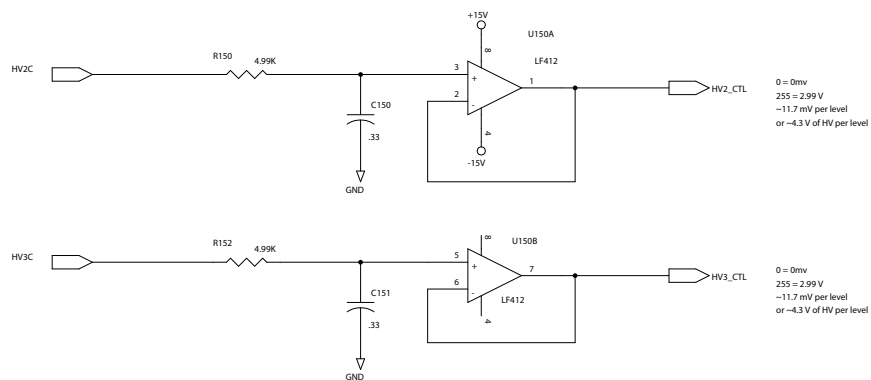
Union Biometrica Inc.			
35 Medford Street, Suite 101 Somerville, MA 02143			
Title			
Sorter Controller - Flu2 & Flu3 Chans			
Size	Document Number	Rev	
B	350-5001-SC0	D1	
Date:	Tuesday, April 29, 2003	Sheet	5 of 10



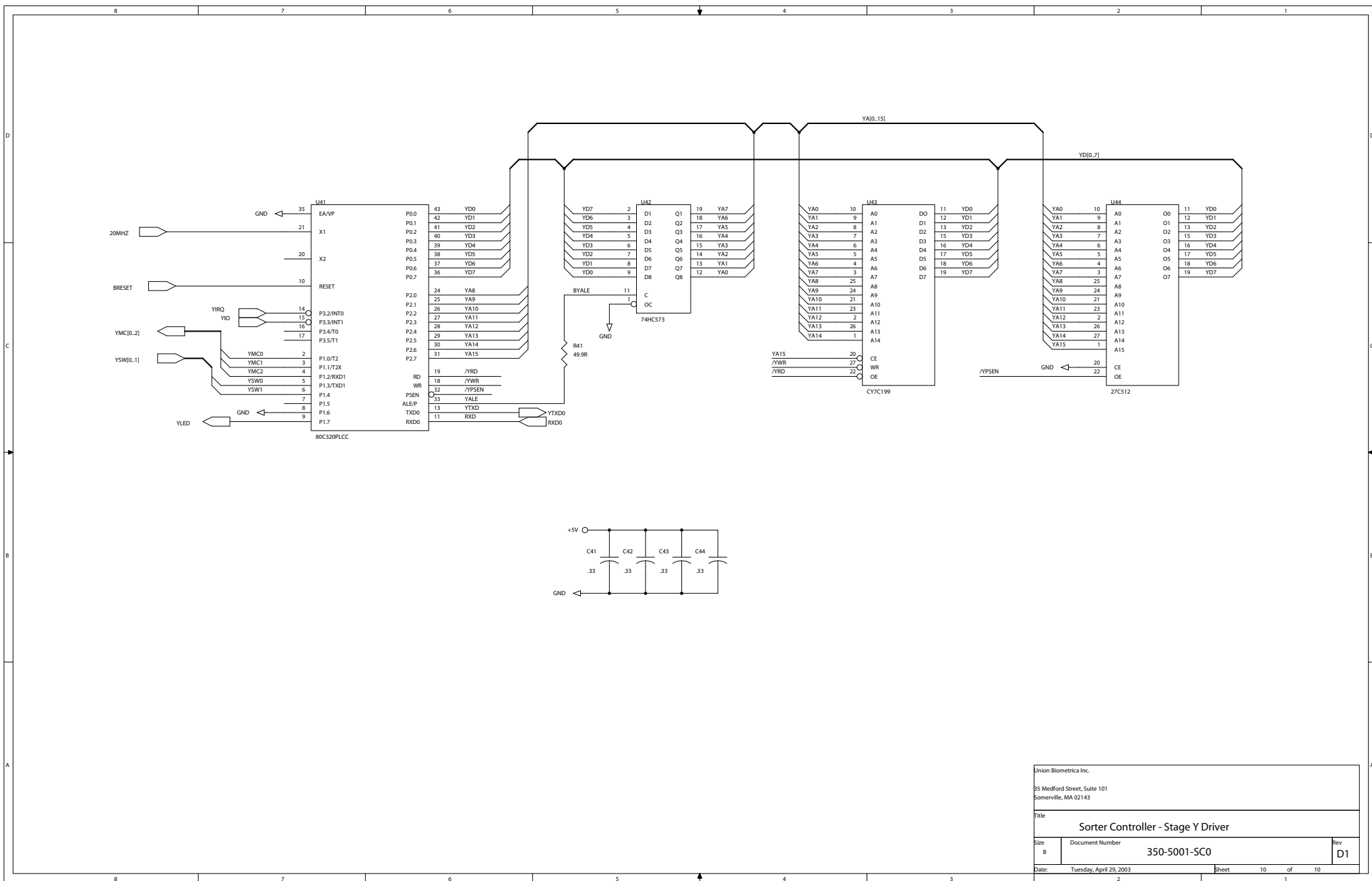




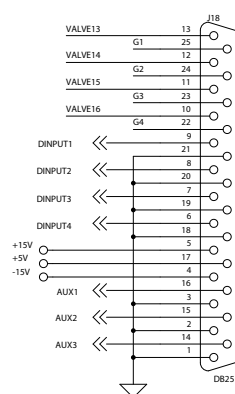
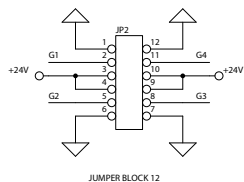
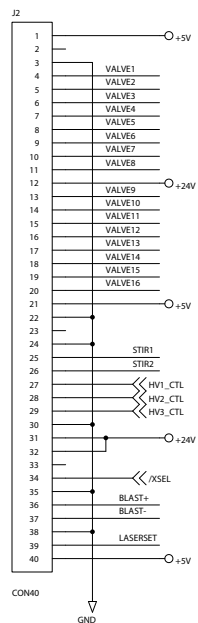
Union Biometrica Inc.			
35 Medford Street, Suite 101			
Somerville, MA 02143			
Title			
Sorter Controller - Stage X Driver			
Size	Document Number		Rev
B	350-5001-SC0		D1
Date:	Tuesday, April 29, 2003		Sheet 8 of 10



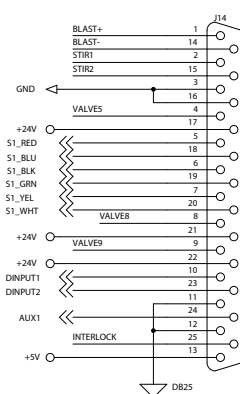
Union Biometrica Inc.		
35 Medford Street, Suite 101 Somerville, MA 02143		
Title Sorter Controller - Misc Buffers & VFCs		
Size B	Document Number 350-5001-SC0	Rev D1
Date: Tuesday, April 29, 2003		
Sheet 9 of 10		



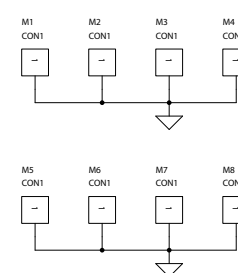
Union Biometrika Inc.			
35 Medford Street, Suite 101 Somerville, MA 02143			
Title			
Sorter Controller - Stage Y Driver			
Size	Document Number	Rev	
B	350-5001-SC0	D1	
Date:	Tuesday, April 29, 2003	Sheet	10 of 10
	2		1



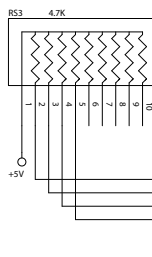
AUXILIARY



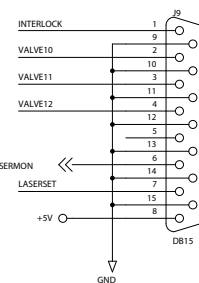
VALVES & MOTOR 1



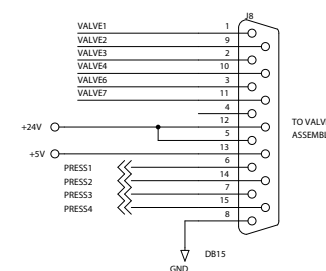
Existing Rework Not Shown:
V16 becomes Optest, old XCTL2, which
is pulled up to +15V via 1.5K.



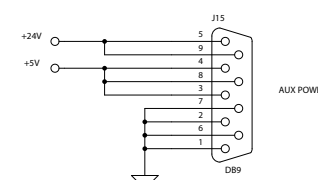
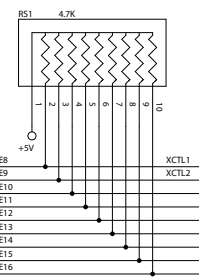
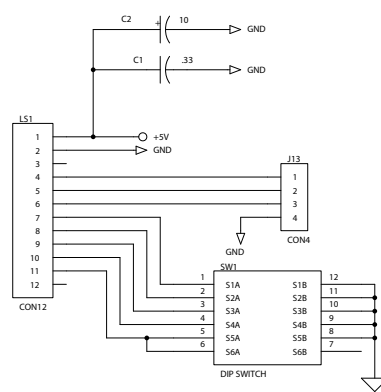
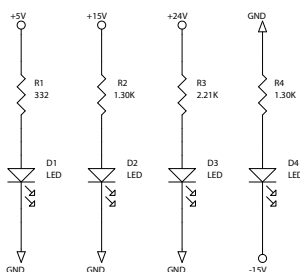
JUMPER BLOCK 8



TO LASER ASSEMBLY

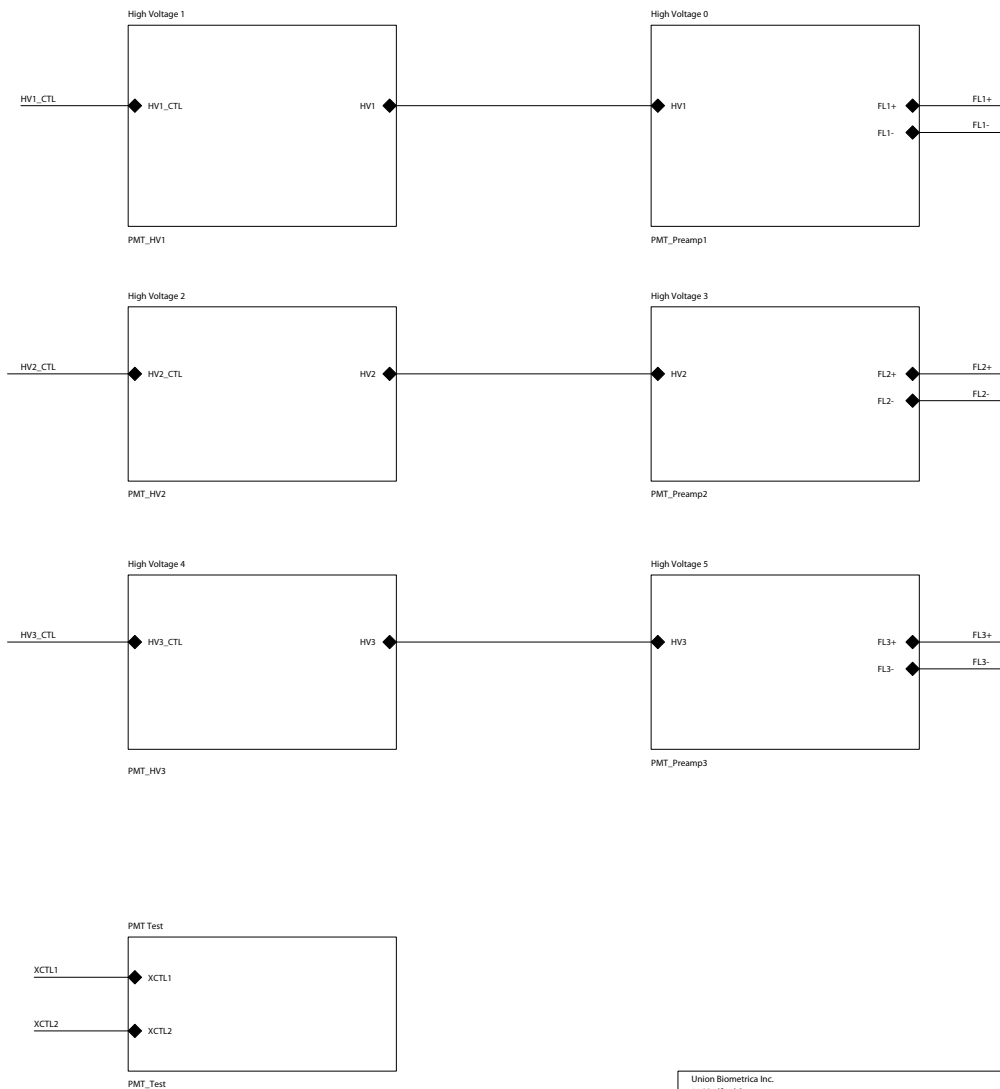
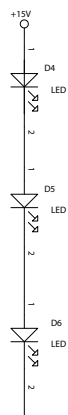
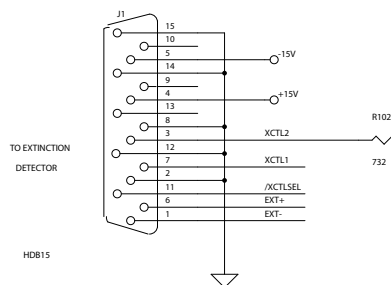
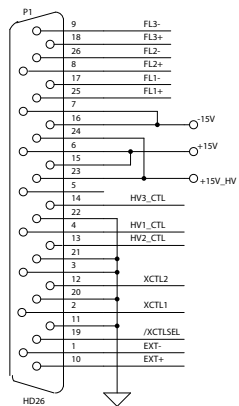


TO VALVE ASSEMBLY

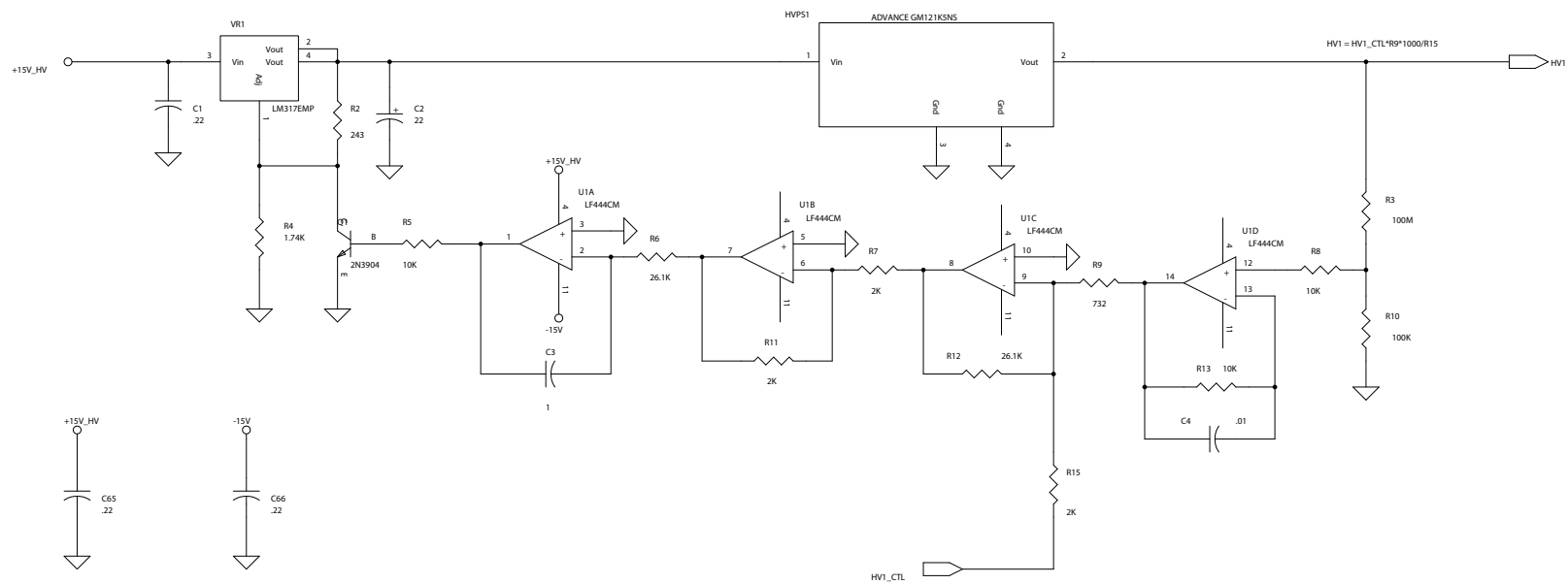


AUX POWER

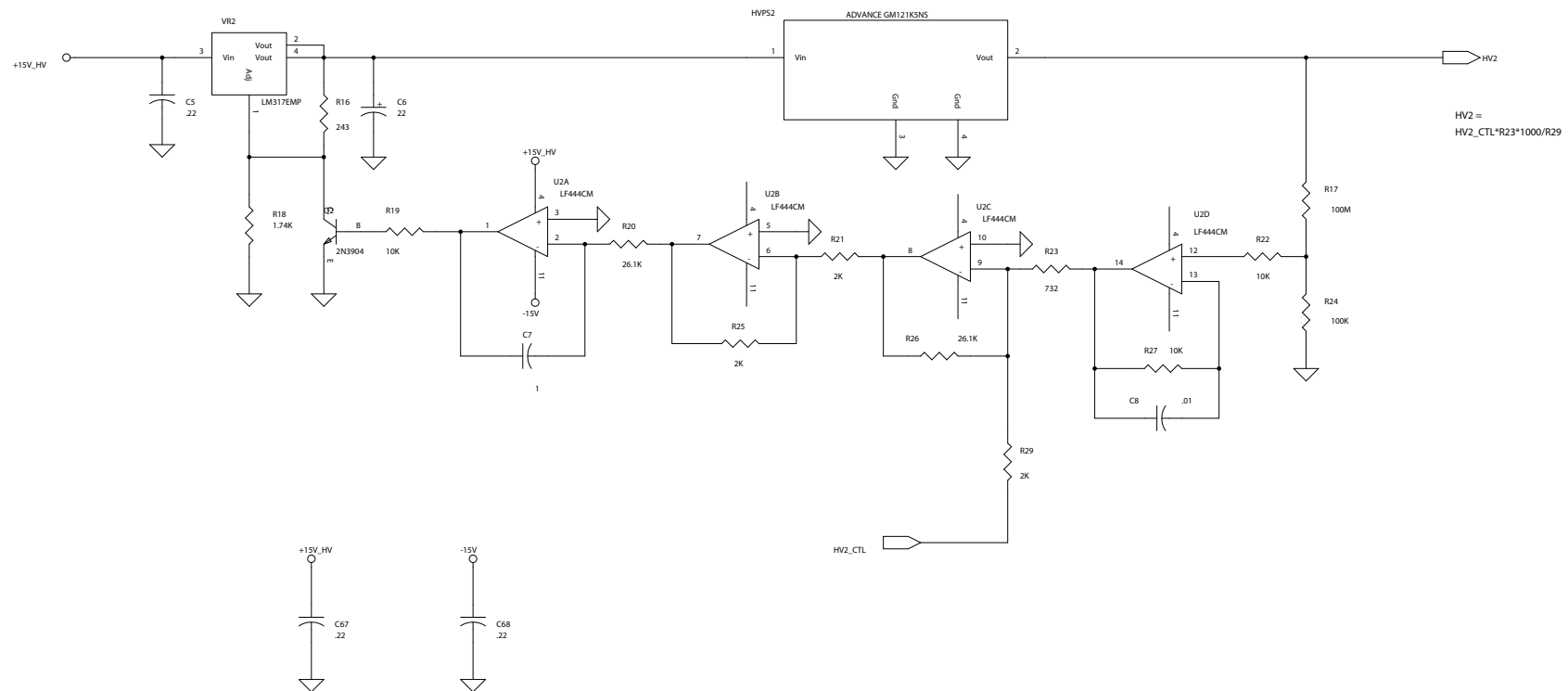
Union Biometrika Inc. 35 Medford Street Somerville, MA 02143			
Title Bulkhead Connector - Valves & Red Laser			
Size B	Document Number 350-5002-SC0	Rev A3	
Date: Tuesday, April 29, 2003	Sheet 2	of 2	



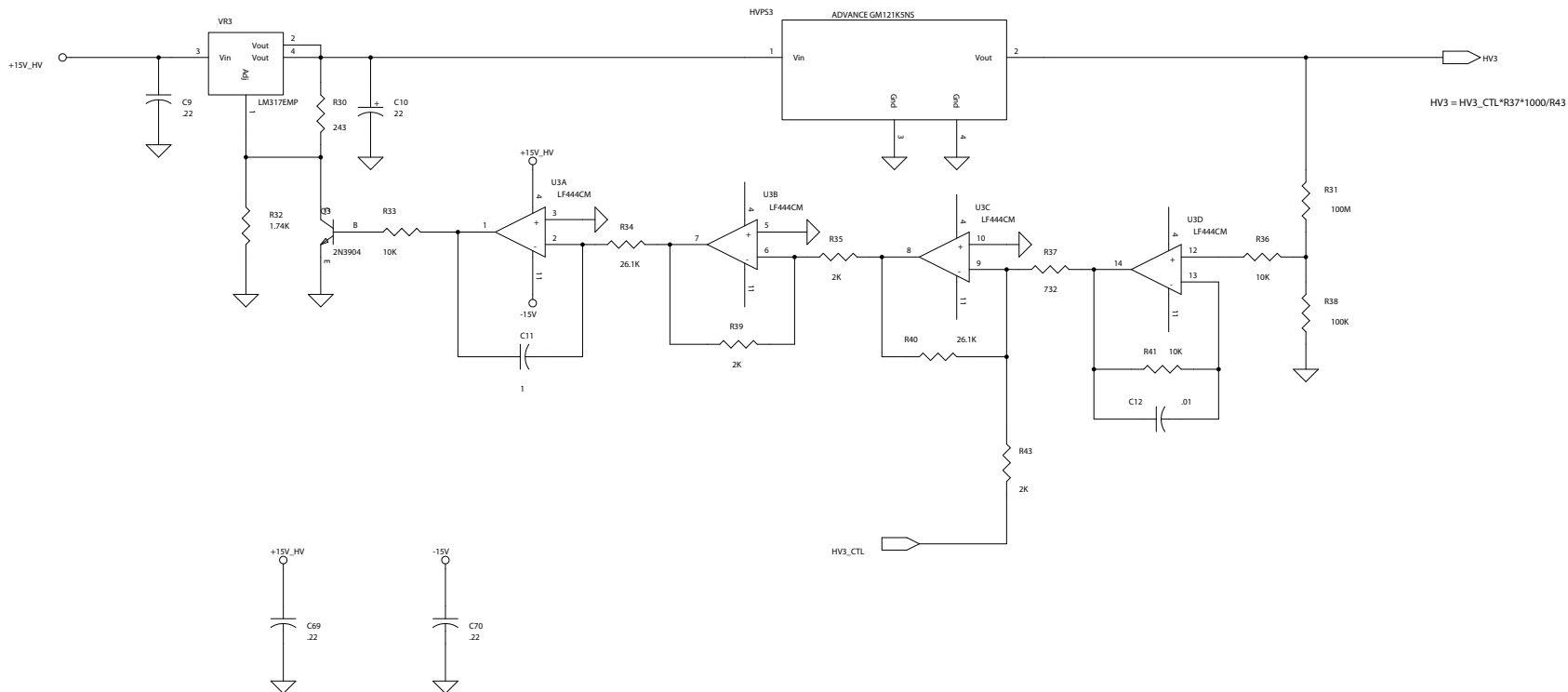
Union Biometrika Inc. 35 Medford Street Somerville, MA 02143		
Title PMT Preamp/HV - Top Level		
Size B	Document Number 350-5009-SC0	Rev A1
Date: Tuesday, April 29, 2003	Sheet 1	of 1



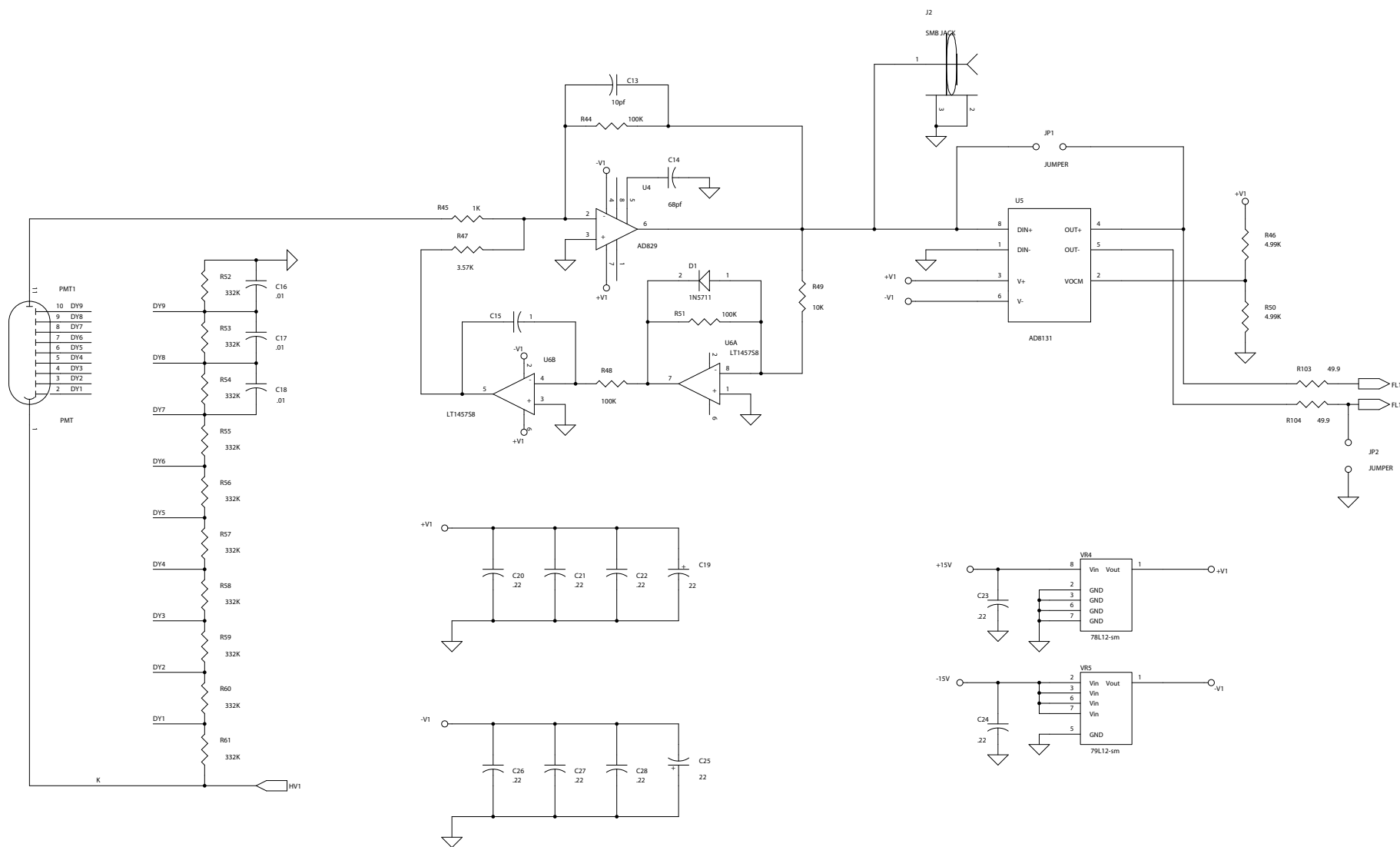
Union Biometrica Inc. 35 Medford Street Somerville, MA 02143			
Title PMT Preamp/HV - HV1			
Size B	Document Number 350-5009-SC0	Rev A1	
Date: Wednesday, April 30, 2003	Sheet 2	of 7	



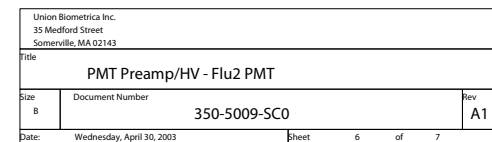
Union Biometrica Inc. 35 Medford Street Somerville, MA 02143		
Title		
PMT Preamp/HV - HV2		
Size	Document Number	Rev
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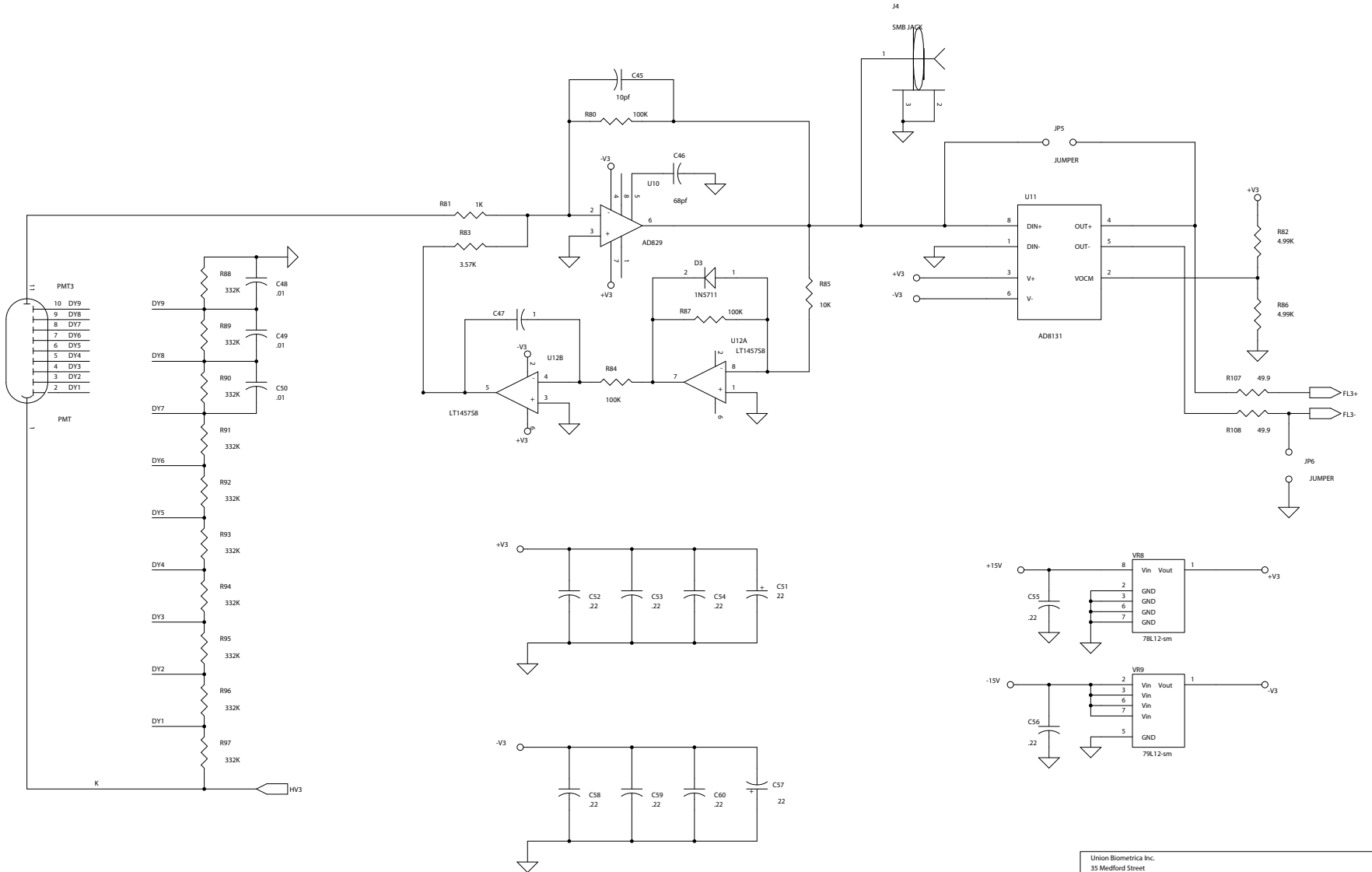


Union Biometrika Inc. 35 Medford Street Somerville, MA 02143		
Title		
PMT Preamp/HV - HV3		
Size	Document Number	Rev
B	350-5009-SC0	A1
Date:	Wednesday, April 30, 2003	Sheet 4 of 7



Union Biometrika Inc. 35 Medford Street Somerville, MA 02143			
Title PMT Preamp/HV - Flu1 PMT			
Size B	Document Number 350-5009-SC0	Rev A1	
Date: Wednesday, April 30, 2003	Sheet 5	of 7	





Union Biometrika Inc. 35 Medford Street Somerville, MA 02143			
Title PMT Preamp/HV - Flu3 PMT			
Size B	Document Number 350-5009-SC0		Rev A1
Date:	Tuesday, April 29, 2003	Sheet	7 of 7

Contact Information

Union Biometrica, Inc. has offices in the United States and Europe.

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Fax: +32 (0) 14 570 621
Email: sales@unionbio.com

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This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

